kasneb

CIFA PART III SECTION 5

FIXED INCOME INVESTMENTS ANALYSIS

THURSDAY: 26 November 2020.   Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE
(a) In relation to bond indenture:

    (i)   Distinguish between "affirmative covenant" and "negative covenant".   (4 marks)

    (ii)   Highlight three types of information contained in a bond indenture.   (3 marks)

(b) Explain four methods that could be used by the Central Bank of your country to issue sovereign debt.   (4 marks)

(c) The following information relates to XYZ Pension Fund:

    1.   Annual pension obligations is Sh.2 million paid in perpetuity.
    2.   The duration of 5-year maturity bonds with annual coupon rates of 12% is 4 years.
    3.   The duration of 20-year maturity bonds with annual coupon rates of 6% is 11 years.
    4.   The yield to maturity on all bonds is 16%.

    Required:
    (i)   The amount to be held in each bond to fully fund and immunise the pension obligation.   (3 marks)

    (ii)   The par value of the holdings in the 20-year coupon bond.   (2 marks)

(d) Mildred Naliaka would like to invest in a 6%, 25 year bond selling to yield 9%. The modified duration for the bond is 10.62 and the convexity is 182.92.

    Required:
    The percentage change in price of the bond assuming that the required yield increases by 200 basis points from 9% to 11%.   (4 marks)
    (Total: 20 marks)

QUESTION TWO
(a) Examine four relationships between yield change and bond price behaviour.   (4 marks)

(b) A financial analyst has gathered the following information about the yield structure of an AAA rated corporate bond:

Period	Yield (%)
3 months	8.50
6 months	9.25
1 year	10.50
2 years	11.25
3 years and above	12.00

    Required:
    The implicit one-year forward rate:

    (i)   In year 2.   (2 marks)

    (ii)   In year 3.   (2 marks)

(c)   Juhudi Ltd. has a Sh.60 million bond issue outstanding that has a 12% annual coupon interest rate and 20 years remaining to maturity. The bond was sold five years ago. The floatation cost was Sh.3 million which the company has been amortising on a straight-line basis over the 25 year original life of the bond. The bond has a call provision that makes it possible for the company to retire the issue at this time by calling the bonds at a 10% call premium.

Investment bankers have assured the company that it could sell an additional Sh.60 million worth of 20 year bonds at an interest rate of 9%.

To ensure that the funds required to payoff the old debt will be available, the new bonds will be sold one month before the old bond is called, so for one month, interest will have to be paid on the two bond issues.

Current short-term interest rates are 6%. Predictions are that long term interest rates are unlikely to fall below 9%. Floatation costs on a new refunding issue will amount to Sh.2,650,000.

Juhudi Ltd.'s corporate tax rate is 30% and after tax cost of debt is approximately 6.3%.

Required:
Using relevant computations, advise Juhudi Ltd. on whether to refund the 12%, Sh.60 million bond.   (12 marks)

(Total: 20 marks)

QUESTION THREE

(a)   Explain the following terms used in fixed income investments analysis:

   (i)   Term to maturity of a bond.   (2 marks)

   (ii)   Principal value of a bond.   (2 marks)

   (iii)   Coupon rate.   (2 marks)

   (iv)   Reinvestment income.   (2 marks)

   (v)   Embedded options.   (2 marks)

(b)   The following information relates to a bond transition matrix developed by a rating agency for a one-year period:

Rating at start of year	Rating at end of year								
	AAA	AA	A	BBB	BB	B	CCC	D	Total
AAA	93.20	6	0.6	0.12	0.08	0.0	0.0	0.0	100
AA	1.60	92.75	5.07	0.36	0.11	0.07	0.03	0.01	100
A	0.18	2.65	91.91	4.80	0.37	0.02	0.02	0.05	100
BBB	0.04	0.30	5.20	87.70	5.70	0.70	0.16	0.20	100
BB	0.03	0.11	0.61	6.80	81.65	7.10	2.60	1.10	100
B	0.01	0.09	0.55	0.88	7.90	75.67	8.70	6.20	100
CCC	0.0	0.01	0.31	0.84	2.30	8.10	62.54	25.90	100

Note: The first four ratings, are investment grades.

Required:
   (i)   The probability that a Bond rated BBB will be downgraded.   (1 mark)

   (ii)   The probability that a Bond rated BBB will go into default.   (1 mark)

   (iii)   The probability that a Bond rated BBB will be upgraded.   (1 mark)

   (iv)   The probability that a Bond rated B will be upgraded to investment grade.   (1 mark)

   (v)   The probability that a Bond rated A will be downgraded to non-investment grades.   (1 mark)

   (vi)   The probability that a Bond rated AAA will not be downgraded at the end of one year.   (1 mark)

(c)   The yield of a Sh.1000, 3.5% coupon 5-year annual pay bond in Nairobi Securities Exchange is 2.8%. The same bond sells for an equivalent Sh.1,019.80 in Uganda Securities Exchange.

Required:
Determine whether there is an arbitrage opportunity and demonstrate how it could be exploited.   (4 marks)
(Total: 20 marks)

QUESTION FOUR

(a)   Explain the difference between "liquidity preference theory" and "preferred habitat theory" in relation to term structure of interest rates.   (4 marks)

(b)   Explain four risks that could be faced by investors who rely on ratings provided by credit rating agencies.   (4 marks)

(c)   A financial analyst is assessing Crystal Ltd., a Multimedia Company, with the following selected financial information:

	2018 Sh."million"	2019 Sh."million"
Operating income	6,456	7,726
Revenue	38,063	40,893
Depreciation and amortisation	1,713	1,841
Capital expenditures	2,110	3,559
Cash flow from operations	6,578	6,994
Total debt	12,480	13,977
Total equity	37,519	37,385
Dividend paid	653	756
Interest expense	330	360

Note: Free cash flow (FCF) is after dividends for all calculations.

Required:
Calculate the following cash flows and ratios for each of the years ended 2018 and 2019:

(i)   Earnings before interest, tax, depreciation and amortisation (EBITDA).   (2 marks)

(ii)   Free cash flow (FCF) after dividends.   (2 marks)

(iii)   Operating margin.   (2 marks)

(iv)   EBITDA/Interest.   (2 marks)

(v)   FCF/Debt.   (2 marks)

(vi)   Debt/Capital.   (2 marks)
(Total: 20 marks)

QUESTION FIVE

(a)   Citing three reasons, explain why term to maturity of a bond is important to an investor.   (3 marks)

(b)   A fixed income manager has constructed a sample portfolio of treasury bonds with different maturities as follows:

Security	Weight (%)	Current yield	Key rate duration
2 year	45	4.50	0.91
10 year	15	4.63	2.15
20 year	10	4.82	3.89
25 year	30	4.97	4.12

Required:

(i)   The effective duration for the portfolio for a parallel shift in the yield curve.

(4 marks)

(ii)   Assume that the yield curve shifts in a non-parallel fashion and the anticipated change for the 2 year and 10 year rate is an increase of 50 basis point while the 20 year and 25 year rate are expected to increase by 100 basis point.

Determine the effect of this yield shift to the bond's value.

(3 marks)

(c)   An analyst uses the following binomial interest rate to value bonds with embedded options:
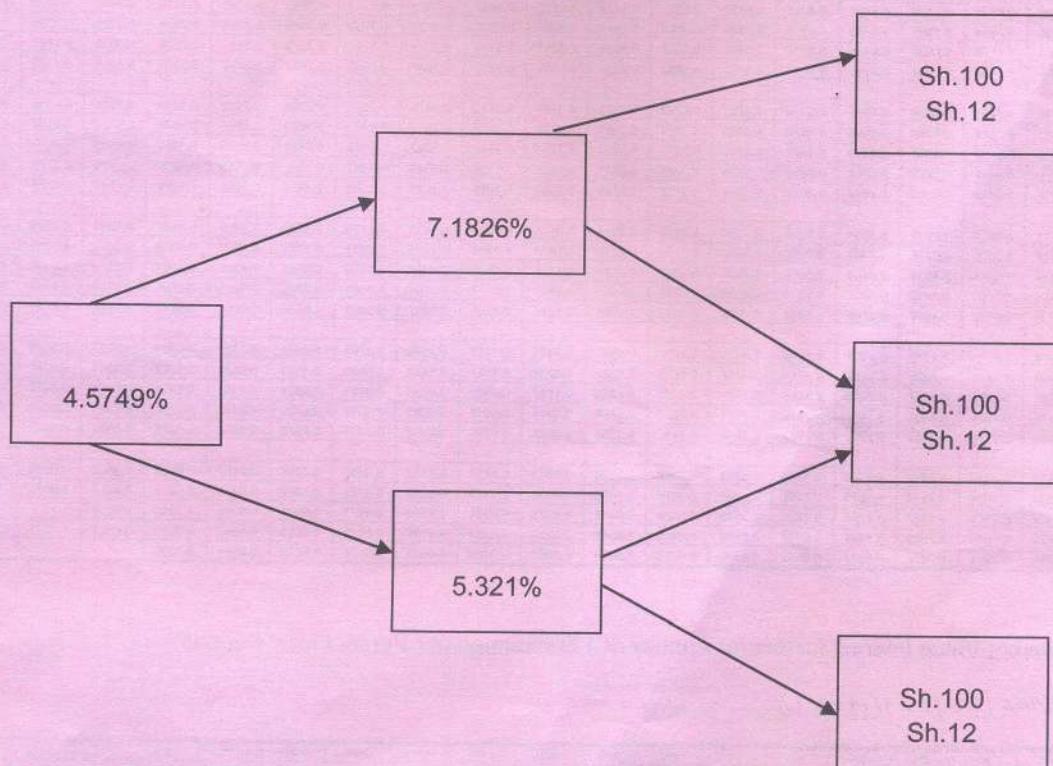
Required:

(i)   Calculate the value of an option free, 12% annual coupon bond with two years remaining to maturity. The bond has a face value of Sh.100.

(4 marks)

(ii)   Calculate the value of embedded call option assuming the above bond is callable at Sh.105 at the end of year 1.

(3 marks)

(iii)   Determine the value of embedded put option assuming the above bond is putable at Sh.105 at the end of year 1.

(3 marks)

(Total: 20 marks)

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Present Value Interest factor of 1 Received at the End of *n* Periods at *r* Percent:

$$PVIF_{r,n} = 1 / (1+r)^n = (1+r)^{-n}$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	20%	24%	25%	30%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.9009	0.8929	0.8850	0.8772	0.8696	0.8621	0.8333	0.8065	0.8000	0.7692
2	0.9803	0.9612	0.9426	0.9246	0.9070	0.8900	0.8734	0.8573	0.8417	0.8264	0.8116	0.7972	0.7831	0.7695	0.7561	0.7432	0.6944	0.6504	0.6400	0.5917
3	0.9706	0.9423	0.9151	0.8890	0.8638	0.8396	0.8163	0.7938	0.7722	0.7513	0.7312	0.7118	0.6931	0.6750	0.6575	0.6407	0.5787	0.5245	0.5120	0.4552
4	0.9610	0.9238	0.8885	0.8548	0.8227	0.7921	0.7629	0.7350	0.7084	0.6830	0.6587	0.6355	0.6133	0.5921	0.5718	0.5523	0.4823	0.4230	0.4096	0.3501
5	0.9515	0.9057	0.8626	0.8219	0.7835	0.7473	0.7130	0.6806	0.6499	0.6209	0.5935	0.5674	0.5428	0.5194	0.4972	0.4761	0.4019	0.3411	0.3277	0.2693
6	0.9420	0.8880	0.8375	0.7903	0.7462	0.7050	0.6663	0.6302	0.5963	0.5645	0.5346	0.5066	0.4803	0.4556	0.4323	0.4104	0.3349	0.2751	0.2621	0.2072
7	0.9327	0.8706	0.8131	0.7599	0.7107	0.6651	0.6227	0.5835	0.5470	0.5132	0.4817	0.4523	0.4251	0.3996	0.3759	0.3538	0.2791	0.2218	0.2097	0.1594
8	0.9235	0.8535	0.7894	0.7307	0.6768	0.6274	0.5820	0.5403	0.5019	0.4665	0.4339	0.4039	0.3762	0.3506	0.3269	0.3050	0.2326	0.1789	0.1678	0.1226
9	0.9143	0.8368	0.7664	0.7026	0.6446	0.5919	0.5439	0.5002	0.4604	0.4241	0.3909	0.3606	0.3329	0.3075	0.2843	0.2630	0.1938	0.1443	0.1342	0.0943
10	0.9053	0.8203	0.7441	0.6756	0.6139	0.5584	0.5083	0.4632	0.4224	0.3855	0.3522	0.3220	0.2946	0.2697	0.2472	0.2267	0.1615	0.1164	0.1074	0.0725
11	0.8963	0.8043	0.7224	0.6496	0.5847	0.5268	0.4751	0.4289	0.3875	0.3505	0.3173	0.2875	0.2607	0.2366	0.2149	0.1954	0.1346	0.0938	0.0859	0.0558
12	0.8874	0.7885	0.7014	0.6246	0.5568	0.4970	0.4440	0.3971	0.3555	0.3186	0.2858	0.2567	0.2307	0.2076	0.1869	0.1685	0.1122	0.0757	0.0687	0.0429
13	0.8787	0.7730	0.6810	0.6006	0.5303	0.4688	0.4150	0.3677	0.3262	0.2897	0.2575	0.2292	0.2042	0.1821	0.1625	0.1452	0.0935	0.0610	0.0550	0.0330
14	0.8700	0.7579	0.6611	0.5775	0.5051	0.4423	0.3878	0.3405	0.2992	0.2633	0.2320	0.2046	0.1807	0.1597	0.1413	0.1252	0.0779	0.0492	0.0440	0.0254
15	0.8613	0.7430	0.6419	0.5553	0.4810	0.4173	0.3624	0.3152	0.2745	0.2394	0.2090	0.1827	0.1599	0.1401	0.1229	0.1079	0.0649	0.0397	0.0352	0.0195
16	0.8528	0.7284	0.6232	0.5339	0.4581	0.3936	0.3387	0.2919	0.2519	0.2176	0.1883	0.1631	0.1415	0.1229	0.1069	0.0930	0.0541	0.0320	0.0281	0.0150
17	0.8444	0.7142	0.6050	0.5134	0.4363	0.3714	0.3166	0.2703	0.2311	0.1978	0.1696	0.1456	0.1252	0.1078	0.0929	0.0802	0.0451	0.0258	0.0225	0.0116
18	0.8360	0.7002	0.5874	0.4936	0.4155	0.3503	0.2959	0.2502	0.2120	0.1799	0.1528	0.1300	0.1108	0.0946	0.0808	0.0691	0.0376	0.0208	0.0180	0.0089
19	0.8277	0.6864	0.5703	0.4746	0.3957	0.3305	0.2765	0.2317	0.1945	0.1635	0.1377	0.1161	0.0981	0.0829	0.0703	0.0596	0.0313	0.0168	0.0144	0.0068
20	0.8195	0.6730	0.5537	0.4564	0.3769	0.3118	0.2584	0.2145	0.1784	0.1486	0.1240	0.1037	0.0868	0.0728	0.0611	0.0514	0.0261	0.0135	0.0115	0.0053
21	0.8114	0.6598	0.5375	0.4388	0.3589	0.2942	0.2415	0.1987	0.1637	0.1351	0.1117	0.0926	0.0768	0.0638	0.0531	0.0443	0.0217	0.0109	0.0092	0.0040
22	0.8034	0.6468	0.5219	0.4220	0.3418	0.2775	0.2257	0.1839	0.1502	0.1228	0.1007	0.0826	0.0680	0.0560	0.0462	0.0382	0.0181	0.0088	0.0074	0.0031
23	0.7954	0.6342	0.5067	0.4057	0.3256	0.2618	0.2109	0.1703	0.1378	0.1117	0.0907	0.0738	0.0601	0.0491	0.0402	0.0329	0.0151	0.0071	0.0059	0.0024
24	0.7876	0.6217	0.4919	0.3901	0.3101	0.2470	0.1971	0.1577	0.1264	0.1015	0.0817	0.0659	0.0532	0.0431	0.0349	0.0284	0.0126	0.0057	0.0047	0.0018
25	0.7798	0.6095	0.4776	0.3751	0.2953	0.2330	0.1842	0.1460	0.1160	0.0923	0.0736	0.0588	0.0471	0.0378	0.0304	0.0245	0.0105	0.0046	0.0038	0.0014
30	0.7419	0.5521	0.4120	0.3083	0.2314	0.1741	0.1314	0.0994	0.0754	0.0573	0.0437	0.0334	0.0256	0.0196	0.0151	0.0116	0.0042	0.0016	0.0012	*
35	0.7059	0.5000	0.3554	0.2534	0.1813	0.1301	0.0937	0.0676	0.0490	0.0356	0.0259	0.0189	0.0139	0.0102	0.0075	0.0055	0.0017	0.0005	*	*
36	0.6989	0.4902	0.3450	0.2437	0.1727	0.1227	0.0875	0.0626	0.0449	0.0323	0.0234	0.0169	0.0123	0.0089	0.0065	0.0048	0.0014	*	*	*
40	0.6717	0.4529	0.3066	0.2083	0.1420	0.0972	0.0668	0.0460	0.0318	0.0221	0.0154	0.0107	0.0075	0.0053	0.0037	0.0026	0.0007	*	*	*
50	0.6080	0.3715	0.2281	0.1407	0.0872	0.0543	0.0339	0.0213	0.0134	0.0085	0.0054	0.0035	0.0022	0.0014	0.0009	0.0006	*	*	*	*

Present Value Interest factors for Annuity of 1 Discounted at r Percent for *n* Periods:

$$PVIFA_{r,n} = [1 - 1 / (1+r)^n] / r$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	20%	24%	25%	30%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.9009	0.8929	0.8850	0.8772	0.8696	0.8621	0.8333	0.8065	0.8000	0.7692
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.7125	1.6901	1.6681	1.6467	1.6257	1.6052	1.5278	1.4568	1.4400	1.3609
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4437	2.4018	2.3612	2.3216	2.2832	2.2459	2.1065	1.9813	1.9520	1.8161
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.1024	3.0373	2.9745	2.9137	2.8550	2.7982	2.5887	2.4043	2.3616	2.1662
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6959	3.6048	3.5172	3.4331	3.3522	3.2743	2.9906	2.7454	2.6893	2.4356
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.2305	4.1114	3.9975	3.8887	3.7845	3.6847	3.3255	3.0205	2.9514	2.6427
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.7122	4.5638	4.4226	4.2883	4.1604	4.0386	3.6046	3.2423	3.1611	2.8021
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	5.1461	4.9676	4.7988	4.6389	4.4873	4.3436	3.8372	3.4212	3.3289	2.9247
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.5370	5.3282	5.1317	4.9464	4.7716	4.6065	4.0310	3.5655	3.4631	2.9247
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.8892	5.6502	5.4262	5.2161	5.0188	4.8332	4.1925	3.6819	3.5705	3.0915
11	10.368	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	6.2065	5.9377	5.6869	5.4527	5.2337	5.0286	4.3271	3.7757	3.6564	3.1473
12	11.255	10.575	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.4924	6.1944	5.9176	5.6603	5.4206	5.1971	4.4392	3.8514	3.7251	3.1903
13	12.134	11.348	10.635	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.7499	6.4235	6.1218	5.8424	5.5831	5.3423	4.5327	3.9124	3.7801	3.2233
14	13.004	12.106	11.296	10.563	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.9819	6.6282	6.3025	6.0021	5.7245	5.4675	4.6106	3.9616	3.8241	3.2487
15	13.865	12.849	11.938	11.118	10.380	9.7122	9.1079	8.5595	8.0607	7.6061	7.1909	6.8109	6.4624	6.1422	5.8474	5.5755	4.6755	4.0013	3.8593	3.2682
16	14.718	13.578	12.561	11.652	10.838	10.106	9.4466	8.8514	8.3126	7.8237	7.3792	6.9740	6.6039	6.2651	5.9542	5.6685	4.7296	4.0333	3.8874	3.2832
17	15.562	14.292	13.166	12.166	11.274	10.477	9.7632	9.1216	8.5436	8.0216	7.5488	7.1196	6.7291	6.3729	6.0472	5.7487	4.7746	4.0591	3.9099	3.2948
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.3719	8.7556	8.2014	7.7016	7.2497	6.8399	6.4674	6.1280	5.8178	4.8122	4.0799	3.9279	3.3037
19	17.226	15.678	14.324	13.134	12.085	11.158	10.336	9.6036	8.9501	8.3649	7.8393	7.3658	6.9380	6.5504	6.1982	5.8775	4.8435	4.0967	3.9424	3.3105
20	18.046	16.351	14.877	13.590	12.462	11.470	10.594	9.8181	9.1285	8.5136	7.9633	7.4694	7.0248	6.6231	6.2593	5.9288	4.8696	4.1103	3.9539	3.3158
21	18.857	17.011	15.415	14.029	12.821	11.764	10.836	10.017	9.2922	8.6487	8.0751	7.5620	7.1016	6.6870	6.3125	5.9731	4.8913	4.1212	3.9631	3.3198
22	19.660	17.658	15.937	14.451	13.163	12.042	11.061	10.201	9.4424	8.7715	8.1757	7.6446	7.1695	6.7429	6.3587	6.0113	4.9094	4.1300	3.9705	3.3230
23	20.456	18.292	16.444	14.857	13.489	12.303	11.272	10.371	9.5802	8.8832	8.2664	7.7184	7.2297	6.7921	6.3988	6.0442	4.9245	4.1371	3.9764	3.3254
24	21.243	18.914	16.936	15.247	13.799	12.550	11.469	10.529	9.7066	8.9847	8.3481	7.7843	7.2829	6.8351	6.4338	6.0726	4.9371	4.1428	3.9811	3.3272
25	22.023	19.523	17.413	15.622	14.094	12.783	11.654	10.675	9.8226	9.0770	8.4217	7.8431	7.3300	6.8729	6.4641	6.0971	4.9476	4.1474	3.9849	3.3286
30	25.808	22.396	19.600	17.292	15.372	13.765	12.409	11.258	10.274	9.4269	8.6938	8.0552	7.4957	7.0027	6.5660	6.1772	4.9789	4.1601	3.9950	3.3321
35	29.409	24.999	21.487	18.665	16.374	14.498	12.948	11.655	10.567	9.6442	8.8552	8.1755	7.5856	7.0700	6.6166	6.2153	4.9915	4.1644	3.9984	3.3330
36	30.108	25.489	21.832	18.908	16.547	14.621	13.035	11.717	10.612	9.6765	8.8786	8.1924	7.5979	7.0790	6.6231	6.2201	4.9929	4.1649	3.9987	3.3331
40	32.835	27.355	23.115	19.793	17.159	15.046	13.332	11.925	10.757	9.7791	8.9511	8.2438	7.6344	7.1050	6.6418	6.2335	4.9966	4.1659	3.9995	3.3332
50	39.196	31.424	25.730	21.482	18.256	15.762	13.801	12.233	10.962	9.9148	9.0417	8.3045	7.6752	7.1327	6.6605	6.2463	4.9995	4.1666	3.9999	3.3333

CIFA PART III SECTION 5

FIXED INCOME INVESTMENTS ANALYSIS

TUESDAY: 26 November 2019.   Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE
(a)   Fixed income securities provide investors with a return in form of periodic payments and eventual return of the principal at maturity.

With reference to the above statement, identify four types of fixed income securities available to investors in your country.   (4 marks)

(b)   Explain the following terms as used in the global bonds markets:

    (i)   Supranational bonds.   (1 mark)

    (ii)   Euroyen bonds.   (1 mark)

    (iii)   Offshore bond market.   (1 mark)

    (iv)   Yankee bonds.   (1 mark)

(c)   As a fixed income analyst at a renowned investment bank, you have been presented with the following details regarding a five-year convertible bond issued by Bamboo Limited.

Par value	Sh.1,000
Coupon rate	8.5%
Market price of convertible bond	Sh.900
Conversion ratio	30
Estimated straight value of the bond	Sh.700

The market price of Bamboo Limited's ordinary shares is Sh.25 and the divided per share (DPS) is Sh.1 per annum.

Required:
Compute the following:
    (i)   Conversion value of the bond.   (1 mark)

    (ii)   Market conversion price.   (1 mark)

    (iii)   Conversion premium ratio.   (1 mark)

    (iv)   Premium over straight value.   (1 mark)

    (v)   Favourable income differential per share.   (2 marks)

(d) A 7% annual coupon bond has two years to maturity. The interest rate tree is illustrated below:
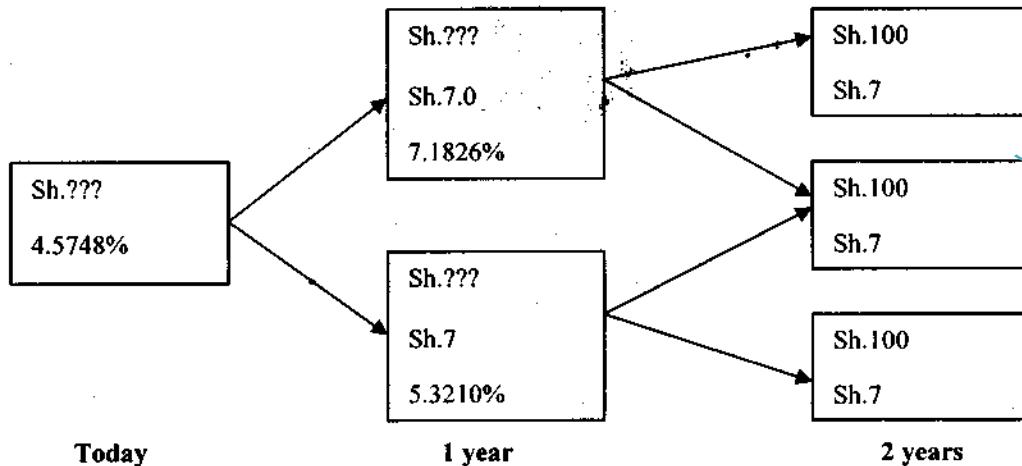
The bond has a par value of Sh.100

Required:
Determine the value of the bond today. (6 marks)
(Total: 20 marks)

QUESTION TWO

(a) Highlight five properties of duration as used in fixed income securities. (5 marks)

(b) A bond dealer provides the following information on a portfolio of fixed income securities:

Bond	Par value Sh.(million)	Market price (Sh.)	Coupon rate (%)	Modified duration	Effective duration	Effective convexity
W	2	100	6.5	8	8	154
X	3	93	5.5	6	1	50
Y	1	95	7	8.5	8.5	130
Z	4	103	8	9	5	-70

Required:

(i) The effective duration for the portfolio. (2 marks)

(ii) The price value of a basis point (PVBP) for the portfolio. (2 marks)

(iii) Giving reason(s), identify the bond(s) with no embedded options. (2 marks)

(iv) Giving reason(s), identify the callable bond(s). (2 marks)

(v) Giving reason(s), identify the putable bond(s). (2 marks)

(vi) Determine the approximate price change for the 7% bond assuming that the yield-to-maturity (YTM) increases by 25 basis points. (2 marks)

(c) The following information relates to a 6% annual coupon treasury note with 1.5years to maturity:

Maturity	Spot rate
6 months	5%
1 year	6%
1.5 years	7%

The par value of the treasury note is Sh.1,000.

Required:
The arbitrage profit assuming that the treasury note is selling for Sh.992. (3 marks)
(Total: 20 marks)

QUESTION THREE

(a) Explain four reasons why fixed income analysts prefer to use London Interbank Offered Rate (LIBOR) curve as a benchmark for valuing fixed income securities. (4 marks)

(b) An analyst gathers the following data relating to a 3% coupon corporate bond that matures in 2 years:

Period	Years to maturity	Spot rate (%)	Corporate spread (%)
1	0.5	3.00	0.50
2	1.0	3.30	0.50
3	1.5	3.50	0.50
4	2.0	4.00	0.50

The par value of the bond is Sh.100

Required:
Determine the bond's price. (4 marks)

(c) The bond equivalent yield (BEY) spot rates for treasury yields are provided below:

Period	Maturity	Spot rate (%)
1	0.5	1.20
2	1.0	2.10
3	1.5	2.80
4	2.0	3.30

Required:
The 6-month forward rate one year from now using bond equivalent yield (BEY). (4 marks)

(d) Four non-convertible bonds have the yield spreads to treasury securities as shown below:

Bond	Maturity (years)	Nominal spread (bps)	Zero volatility spread (bps)	Option adjusted spread (OAS) (bps)
W	2	156	155	130
X	3	173	174	199
Y	5	188	189	164
Z	10	202	201	226

Required:
Analyse the bonds based on the above spreads. (4 marks)

(e) A bond with a coupon rate of 8% and a full price of Sh.908 has a yield-to-maturity (YTM) of 9%. The bond duration is 9.42 and its convexity is 68.33.

Required:
Estimate the change in the full price of the bond for a 30 basis point increase in yield-to-maturity. (4 marks)
(Total: 20 marks)

QUESTION FOUR

(a) Analyse five factors that could affect the repurchase agreement (repo) margin. (5 marks)

(b) (i) In the context of bond pricing, explain the term "matrix pricing". (2 marks)

(ii) Geoffrey Musomi is estimating the value of a non traded 4% annual pay, BB rated bond that has five years remaining to maturity. He has obtained the following yield-to-maturity (YTM) on similar corporate bonds:

- BB rated, 4 year annual pay 5% coupon bond YTM = 4.738%
- BB rated, 6 year annual pay 4% coupon bond YTM = 5.232%
- BB rated, 6 year annual pay 6% coupon bond YTM = 5.284%

Required:
The value of the non traded bond. (4 marks)

(c) Highlight two strengths and two weaknesses of structural models in credit analysis. (4 marks)

(d) Neta Ltd. is a high yield bond issuer with a credit rating of Ba2/BB. The company has presented the following financial information:

	Sh."million"		Sh."million"
Cash	10	Accounts payable	10
Accounts receivable	15	Short term debt	5
Inventories	55	Current portion of long-term debt	3
Land	10	Long-term bank loans	30
Property, plant and equipment	85	Secured bonds	10
Good will	25	Unsecured bonds	20
		Net pension liability	22
		Paid-in-capital	10
		Retained earnings	90
Total assets	**200**	**Total liabilities and equity**	**200**

Additional information:
1. For the year ended 30 September 2019, Neta Ltd.'s earnings before interests, taxes, depreciation and amortisation (EBITDA) were Sh.45 million.
2. For firms in Neta Ltd.'s industry, credit rating standards for an investment grade (Baa3/BBB) credit rating include a debt to EBITDA ratio of less than 1.8x and a debt to capital ratio based on all sources of financing less than 40%.
3. On an investors briefing, Neta's management states that they believe Neta Ltd. should be upgraded to investment grade based on its debt to EBITDA ratio of 1.5x and its debt to capital ratio of 34%.

Required:
Using relevant financial ratios, explain why a credit analyst might disagree with the management's assessment.

(5 marks)
(Total: 20 marks)

QUESTION FIVE

(a) (i) Explain the term "riding the yield curve strategy" as used in active bond portfolio management. (2 marks)

(ii) Summarise three applications of yield curve. (3 marks)

(b) Johnstone Mwau is the portfolio manager of fixed income securities at Alpha Bank Limited and is examining the term structure of credit spread for one of the bank's holdings. He has obtained the following data on Mbuni Corporate's 5 year, 3% senior unsecured bond issued three years ago:

Payment date	Risk-free rate (%)	Credit spread (%)
30 September 2021	0.15	0.01
31 March 2022	0.22	0.02
30 September 2022	0.25	0.03
31 March 2023	0.27	0.04

The rates given above are continuously compounded annual rate:

The bond has a par value of Sh.1,000

Required:
The present value of expected loss for the bond. (5 marks)

(c) You are analysing three bonds; A, B, and C each with a face value of Sh.10,000, 12% coupon rate and five years maturity. Bond A pays interest annually while bond B and C pay interest semi-annually and quarterly respectively:

Required:
(i) The price for bond A, B and C assuming yield-to-maturity (YTM) is 10%, 12% and 16% respectively. (9 marks)

(ii) Comment on the relationship between bond price, coupon payments and the yield-to-maturity from the computations in (c) (i) above. (1 mark)
(Total: 20 marks

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Present Value of 1 Received at the End of n Periods:

$$PVIF_{r,n} = 1/(1+r)^n = (1+r)^{-n}$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1	.9901	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9174	.9091	.8929	.8772	.8696	.8621	.8475	.8333	.8065	.7813	.7576	.7353
2	.9803	.9612	.9426	.9246	.9070	.8900	.8734	.8573	.8417	.8264	.7972	.7695	.7561	.7432	.7182	.6944	.6504	.6104	.5739	.5407
3	.9706	.9423	.9151	.8890	.8638	.8396	.8163	.7938	.7722	.7513	.7118	.6750	.6575	.6407	.6086	.5787	.5245	.4768	.4348	.3975
4	.9610	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.7084	.6830	.6355	.5921	.5718	.5523	.5158	.4823	.4230	.3725	.3294	.2923
5	.9515	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6499	.6209	.5674	.5194	.4972	.4761	.4371	.4019	.3411	.2910	.2495	.2149
6	.9420	.8880	.8375	.7903	.7462	.7050	.6663	.6302	.5963	.5645	.5066	.4556	.4323	.4104	.3704	.3349	.2751	.2274	.1890	.1580
7	.9327	.8706	.8131	.7599	.7107	.6651	.6227	.5835	.5470	.5132	.4523	.3996	.3759	.3538	.3139	.2791	.2218	.1776	.1432	.1162
8	.9235	.8535	.7894	.7307	.6768	.6274	.5820	.5403	.5019	.4665	.4039	.3506	.3269	.3050	.2660	.2326	.1789	.1388	.1085	.0854
9	.9143	.8368	.7664	.7026	.6446	.5919	.5439	.5002	.4604	.4241	.3606	.3075	.2843	.2630	.2255	.1938	.1443	.1084	.0822	.0628
10	.9053	.8203	.7441	.6756	.6139	.5584	.5083	.4632	.4224	.3855	.3220	.2697	.2472	.2267	.1911	.1615	.1164	.0847	.0623	.0462
11	.8963	.8043	.7224	.6496	.5847	.5268	.4751	.4289	.3875	.3505	.2875	.2366	.2149	.1954	.1619	.1346	.0938	.0662	.0472	.0340
12	.8874	.7885	.7014	.6246	.5568	.4970	.4440	.3971	.3555	.3186	.2567	.2076	.1869	.1685	.1372	.1122	.0757	.0517	.0357	.0250
13	.8787	.7730	.6810	.6006	.5303	.4688	.4150	.3677	.3262	.2897	.2292	.1821	.1625	.1452	.1163	.0935	.0610	.0404	.0271	.0184
14	.8700	.7579	.6611	.5775	.5051	.4423	.3878	.3405	.2992	.2633	.2046	.1597	.1413	.1252	.0985	.0779	.0492	.0316	.0205	.0135
15	.8613	.7430	.6419	.5553	.4810	.4173	.3624	.3152	.2745	.2394	.1827	.1401	.1229	.1079	.0835	.0649	.0397	.0247	.0155	.0099
16	.8528	.7284	.6232	.5339	.4581	.3936	.3387	.2919	.2519	.2176	.1631	.1229	.1069	.0930	.0708	.0541	.0320	.0193	.0118	.0073
17	.8444	.7142	.6050	.5134	.4363	.3714	.3166	.2703	.2311	.1978	.1456	.1078	.0929	.0802	.0600	.0451	.0258	.0150	.0089	.0054
18	.8360	.7002	.5874	.4936	.4155	.3503	.2959	.2502	.2120	.1799	.1300	.0946	.0808	.0691	.0508	.0376	.0208	.0118	.0068	.0039
19	.8277	.6864	.5703	.4746	.3957	.3305	.2765	.2317	.1945	.1635	.1161	.0829	.0703	.0596	.0431	.0313	.0168	.0092	.0051	.0029
20	.8195	.6730	.5537	.4564	.3769	.3118	.2584	.2145	.1784	.1486	.1037	.0728	.0611	.0514	.0365	.0261	.0135	.0072	.0039	.0021
25	.7798	.6095	.4776	.3751	.2953	.2330	.1842	.1460	.1160	.0923	.0588	.0378	.0304	.0245	.0160	.0105	.0046	.0021	.0010	.0005
30	.7419	.5521	.4120	.3083	.2314	.1741	.1314	.0994	.0754	.0573	.0334	.0196	.0151	.0116	.0070	.0042	.0016	.0006	.0002	.0001
40	.6717	.4529	.3066	.2083	.1420	.0972	.0668	.0460	.0318	.0221	.0107	.0053	.0037	.0026	.0013	.0007	.0002	.0001		
50	.6080	.3715	.2281	.1407	.0872	.0543	.0339	.0213	.0134	.0085	.0035	.0014	.0009	.0006	.0003	.0001				
60	.5504	.3048	.1697	.0951	.0535	.0303	.0173	.0099	.0057	.0033	.0011	.0004	.0002	.0001						

* The factor is zero to four decimal places

Present Value of an Annuity of 1 Per Period for n Periods:

$$PVIF_{r,n} = \sum_{t=1}^{n} \frac{1}{(1+r)^t} = \frac{1 - \frac{1}{(1+r)^n}}{r}$$

Number of payments	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.6901	1.6467	1.6257	1.6052	1.5656	1.5278	1.4568	1.3916	1.3315
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1065	1.9813	1.8684	1.7663
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.0373	2.9137	2.8550	2.7982	2.6901	2.5887	2.4043	2.2410	2.0957
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6048	3.4331	3.3522	3.2743	3.1272	2.9906	2.7454	2.5320	2.3452
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.1114	3.8887	3.7845	3.6847	3.4976	3.3255	3.0205	2.7594	2.5342
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.5638	4.2883	4.1604	4.0386	3.8115	3.6046	3.2423	2.9370	2.6775
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	4.9676	4.6389	4.4873	4.3436	4.0776	3.8372	3.4212	3.0758	2.7860
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.3282	4.9464	4.7716	4.6065	4.3030	4.0310	3.5655	3.1842	2.8681
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.6502	5.2161	5.0188	4.8332	4.4941	4.1925	3.6819	3.2689	2.9304
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	5.9377	5.4527	5.2337	5.0286	4.6560	4.3271	3.7757	3.3351	2.9776
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.1944	5.6603	5.4206	5.1971	4.7932	4.4392	3.8514	3.3868	3.0133
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.4235	5.8424	5.5831	5.3423	4.9095	4.5327	3.9124	3.4272	3.0404
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.6282	6.0021	5.7245	5.4675	5.0081	4.6106	3.9616	3.4587	3.0609
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	6.8109	6.1422	5.8474	5.5755	5.0916	4.6755	4.0013	3.4834	3.0764
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	6.9740	6.2651	5.9542	5.6685	5.1624	4.7296	4.0333	3.5026	3.0882
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.1196	6.3729	6.0472	5.7487	5.2223	4.7746	4.0591	3.5177	3.0971
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.2497	6.4674	6.1280	5.8178	5.2732	4.8122	4.0799	3.5294	3.1039
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.3658	6.5504	6.1982	5.8775	5.3162	4.8435	4.0967	3.5386	3.1090
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.4694	6.6231	6.2593	5.9288	5.3527	4.8696	4.1103	3.5458	3.1129
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	7.8431	6.8729	6.4641	6.0971	5.4669	4.9476	4.1474	3.5640	3.1220
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737	9.4269	8.0552	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1242
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574	9.7791	8.2438	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1250
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617	9.9148	8.3045	7.1327	6.6605	6.2463	5.5541	4.9995	4.1666	3.5714	3.1250
60	44.9550	34.7609	27.6756	22.6235	18.9293	16.1614	14.0392	12.3766	11.0480	9.9672	8.3240	7.1401	6.6651	6.2402	5.5553	4.9999	4.1667	3.5714	3.1250

kasneb

CIFA PART III SECTION 5

FIXED INCOME INVESTMENTS ANALYSIS

WEDNESDAY: 22 May 2019.   Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE

(a) (i) Outline three factors that could determine the price of convertible bonds.   (3 marks)

(ii) The selected data for a convertible bond is presented below:

Issue price   : Sh.1,000 at par
Conversion period   : 13 September 2018 to 12 September 2021
Initial conversion price   : Sh.10 per share
Threshold dividend   : Sh.0.50 per share
Change of control conversion price   : Sh.8 per share
Ordinary share price on issue date   : Sh.8.70
Share price on 17 September 2018   : Sh.9.10
Convertible bond price on 17 September 2018 : Sh.1,123

Required:
The market conversion premium per share for the convertible bond on 17 September 2018.   (3 marks)

(b) A bond with a face value of Sh.1,000 and a recovery rate of 8.6% has a probability of default of 15%.

Required:
(i) The loss given default.   (2 marks)

(ii) The expected loss.   (2 marks)

(c) Babito Fund Management Company (BFMC) has an outstanding 3-year, Sh.1,000 par value bond with a 5.7% coupon rate payable annually. The current market price of the bond is Sh. 97.708. The bond has a yield to maturity (YTM) of 6.034%.

Required:
(i) The price of the bond.   (1 mark)

(ii) The bond's current yield.   (1 mark)

(iii) Explain whether the bond is selling at par, at a discount, or at a premium.   (1 mark)

(iv) Compare the bond's current yield calculated in (c) (ii) above to its YTM.   (2 marks)

(d) Kangaroo Limited's bond which is currently selling at Sh.955, has a 12% coupon interest rate and a Sh.1,000 par value. The bond pays interest annually and has 15 years to maturity.

Required:
(i) The yield to maturity (YTM) on this bond.   (3 marks)

(ii) Explain the relationship that exists between:

• The coupon interest rate and YTM.   (1 mark)

• The par value and market value of a bond.   (1 mark)
                                                                           (Total: 20 marks)

QUESTION TWO

(a) Describe three bond covenants available for high yield issuers. (3 marks)

(b) Summarise three types of securities issued in the Eurobond markets. (3 marks)

(c) Distinguish between "modified duration" and "effective duration" in relation to fixed income risk and return. (2 marks)

(d) Harrison Omeke, a financial analyst at Fanishi Capital has been provided with the following information about bond X for analysis:

Coupon rate	:	8%
Payments	:	Annually
Yield	:	7.634%
Time to maturity	:	10 years
Price	:	Sh.1,024.97
Par value	:	Sh.1,000.

Required:

(i) Macaulay's duration of the bond. (4 marks)

(ii) Interpret the results obtained in (d) (i) above. (2 marks)

(e) A bond is purchased between coupon periods. The number of days between the settlement date and the next coupon payment is 115 days. There are 183 days in the coupon period. The bond has a coupon rate of 7.4% and a par value of Sh.100. There are 10 semi-annual coupon payments remaining.

Required:

(i) The dirty price for the bond assuming a 5.6% discount rate. (4 marks)

(ii) The accrued interest for the bond. (1 mark)

(iii) The clean price of the bond. (1 mark)

(Total: 20 marks)

QUESTION THREE

(a) Your national government intends to issue a Sh.300 billion bond to finance infrastructural development in the country.

As a certified investment and financial analyst, advise the cabinet secretary in charge of the National Treasury on three distribution methods that the government could use to issue the bond. (6 marks)

(b) The following information relates to two callable bonds issued by Yellowline Limited:

	Estimated percentage change in price assuming interest rates change by:	
Bond	**-50 basis points (BPS)**	**+50 basis points (BPS)**
KK	+4%	-8%
ZA	+13%	-10%

Additional information:

1. Both bonds have the same maturity period.
2. The coupon rate for bond KK is 8% while that of bond ZA is 14%.
3. The yield curve for this bond issue is flat at 10%.

Required:

Citing relevant justifications, advise an investor on the bond to invest in. (4 marks)

(c) The yields for Treasuries with different maturities on a certain day were as shown in the following table:

Maturity	Yield (%)
3 months	1.41
6 months	1.71
2 years	2.68
3 years	3.01
5 years	3.70
10 years	4.51
30 years	5.25

Required:

(i) Plot a yield curve for this day. (3 marks)

(ii) Approximate the rate of return for investors holding a 5-year Treasury note starting from now assuming that the expectation hypothesis holds. (2 marks)

(iii) Determine the rate of return for investors holding a 1-year Treasury note starting 2 years from now, assuming that the expectation hypothesis holds. (2 marks)

(iv) Explain the scenario where, even though the yield curve slopes upwards, investors do not expect rising interest rates. (3 marks)

(Total: 20 marks)

QUESTION FOUR

(a) Examine four factors that could be considered by a credit rating agency when evaluating the credit quality of a local currency debt. (4 marks)

(b) A financial analysts is valuing a zero coupon, 4-year corporate bond with a par value of Sh.1,000. The analyst has estimated the risk neutral probability of default for each date for the bond is 1.50% and the recovery rate is 30%. The government bond yield curve is flat at 3%. The analyst has gathered the data on annual payment government bond which is used to construct a binomial interest rate tree based on an assumption of future interest rate volatility of 20%.

1. Par curve for annual payment government bonds:

Maturity	Coupon Rate (%)	Price (Sh.)	Discount factor	Spot rate (%)	Forward rate (%)
1	-0.25	100	1.002506	-0.25	-
2	0.75	100	0.985093	0.7538	1.7677
3	1.50	100	0.955848	1.5166	3.0596
4	2.25	100	0.913225	2.2953	4.6674

2. One year binomial interest rate tree for 20% volatility:
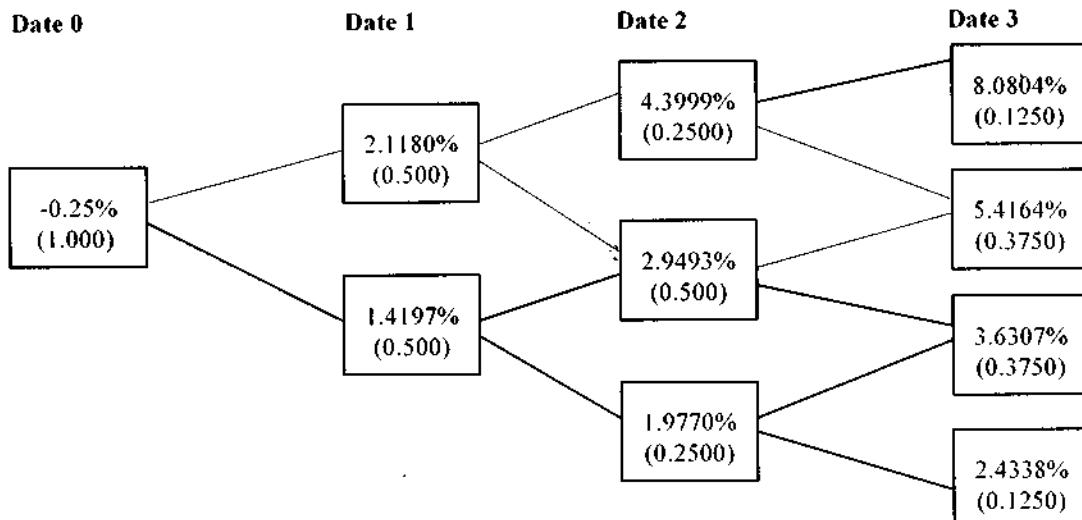
The corporate bond has a market price of Sh.875.

Required:
Determine whether the corporate bond is properly priced. (10 marks)

(c)   The current forward curve for one year rates is provided below:

Time period (Years)	Forward rate (%)
0	1.88
1	2.77
2	3.54
3	4.12

Martin Wendo, a financial analyst, is considering valuing a 4-year, 3.75% annual coupon payment bond with a par value of Sh.100 which has the same risk as the bonds used to obtain the forward curve illustrated above.

Required:
Advise Martin Wendo on the value of the bond using implied spot rates.   (6 marks)
                                                                                        (Total: 20 marks)

QUESTION FIVE

(a)   Argue four cases why investors could prefer to use swap curve over a government bond yield curve in evaluating the performance of fixed income securities.   (4 marks)

(b)   The annual yield to maturity (YTM) for a 6-month and a 1-year Treasury bond is 5.2% and 6.0% respectively. The price of each issue is Sh.100.

The following Treasury yield curve has been estimated for 6-month periods to a maturity of 3 years:

Years to maturity	Annual yield to maturity (%)
1.5	6.2
2.0	6.8
2.5	7.0
3.0	7.2

Required:
The 1.5-year, 2-year and 3-year spot rates.   (6 marks)

(c)   The selected abridged financial data for a large manufacturing firm is presented below:

	Sh. "million"
Cash	1,050
Total debt	7,611
Net debt	6,561
Interest expense	590
Earnings before interest, tax, depreciation and amortisation (EBITDA)	990
Debt structure:	
Secured debt (bank loans and bonds)	4,899
Senior unsecured bonds	1,948
Subordinated bonds	764
Total debt	7,611

Required:
(i)   Gross leverage through each level of debt, including total debt.   (3 marks)

(ii)   The net leverage for the total debt structure.   (1 mark)

(iii)   Explain why the firm has so much secured debt relative to unsecured debt.   (2 marks)

(d)   An investor buys a 4-year, 10% annual coupon bond priced to yield 5%. The investor plans to sell the bond in two years once the second payment is received. The coupon re-investment rate after the bond purchase and the yield to maturity (YTM) at the time of sale is 3%. The par value of the bond is Sh.100.

Required:
The investor's realised rate of return.   (4 marks)
                                                                                        (Total: 20 marks)

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Present Value of 1 Received at the End of n Periods:

$$PVIF_{r,n} = 1/(1+r)^n = (1+r)^{-n}$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1	.9901	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9174	.9091	.8929	8772	8696	.8621	.8475	.8333	.8065	.7813	.7576	.7353
2	.9803	.9612	.9426	.9246	.9070	.8900	.8734	.8573	.8417	.8264	.7972	.7695	.7561	.7432	.7182	.6944	.6504	.6104	.5739	.5407
3	.9706	.9423	.9151	.8890	.8638	.8396	.8163	.7938	.7722	.7513	.7118	.6750	6575	.6407	.6086	.5787	.5245	.4768	.4348	.3975
4	.9610	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.7084	.6830	.6355	.5921	.5718	.5523	.5158	.4623	.4230	.3725	.3294	.2923
5	.9515	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6499	.6209	.5674	5194	4972	.4761	.4371	.4019	.3411	.2910	.2495	.2149
6	.9420	.8880	.8375	.7903	.7462	.7050	.6663	.6302	.5963	.5645	.5066	.4556	.4323	.4104	.3704	.3349	.2751	.2274	.1890	.1580
7	.9327	.8706	.8131	.7599	.7107	.6651	.6227	.5835	.5470	.5132	.4523	.3996	.3759	.3538	.3139	.2791	.2218	.1776	.1432	.1162
8	.9235	.8535	.7894	.7307	.6768	.6274	.5820	.5403	.5019	.4665	.4039	.3506	.3269	.3050	.2660	.2326	.1789	.1388	.1085	.0854
9	.9143	.8368	.7664	.7026	.6446	.5919	.5439	.5002	.4604	.4241	.3606	3075	.2843	.2630	.2255	.1938	.1443	.1084	.0822	.0628
10	.9053	.8203	.7441	.6756	.6139	.5584	.5083	.4632	.4224	.3855	.3220	.2697	.2472	.2267	.1911	.1615	.1164	.0847	.0623	.0462
11	.8963	.8043	.7224	.6496	.5847	.5268	.4751	.4289	.3875	.3505	.2875	.2366	.2149	.1954	.1619	.1346	.0938	.0662	.0472	.0340
12	.8874	.7885	.7014	.6246	.5568	.4970	.4440	.3971	.3555	.3186	.2567	.2076	.1869	1685	.1372	.1122	.0757	.0517	.0357	.0250
13	.8787	.7730	.6810	.6006	.5303	.4688	.4150	.3677	.3262	.2897	.2292	.1821	.1625	.1452	.1163	.0935	.0610	.0404	.0271	.0184
14	.8700	.7579	.6611	.5775	.5051	.4423	.3878	.3405	.2992	.2633	.2046	.1597	.1413	.1252	.0985	.0779	.0492	.0316	.0205	.0135
15	.8613	.7430	.6419	.5553	.4810	.4173	.3624	3152	.2745	.2394	.1827	1401	.1229	.1079	.0835	.0649	.0397	.0247	.0155	0099
16	8528	.7284	.6232	.5339	.4581	.3936	.3387	.2919	.2519	.2176	.1631	.1229	.1069	.0930	.0708	.0541	.0320	.0193	.0118	.0073
17	8444	.7142	.6050	.5134	.4363	.3714	.3166	.2703	.2311	.1978	.1456	.1078	.0929	.0802	.0600	.0451	.0258	.0150	.0089	.0054
18	.8360	.7002	.5074	.4936	.4155	.3503	.2959	.2502	.2120	.1799	.1300	.0946	.0808	.0691	.0508	.0376	.0208	.0118	.0068	.0039
19	.8277	.6864	.5703	.4746	.3957	.3305	.2765	2317	.1945	.1635	.1161	.0829	.0703	.0596	.0431	.0313	.0168	.0092	.0051	.0029
20	.8195	.6730	.5537	.4564	.3769	.3118	.2584	.2145	.1784	.1486	1037	.0728	.0611	.0514	.0365	.0261	.0135	.0072	.0039	.0021
25	.7798	.6095	.4776	.3751	.2953	.2330	.1842	.1460	.1160	.0923	.0588	.0378	.0304	.0245	.0160	.0105	.0046	.0021	.0010	0005
30	.7419	.5521	.4120	.3083	.2314	.1741	.1314	.0994	.0754	.0573	.0334	.0196	.0151	.0116	.0070	.0042	.0016	0006	.0002	.0001
40	.6717	.4529	.3066	.2083	.1420	.0972	.0668	.0460	.0318	.0221	.0107	.0053	.0037	.0026	.0013	.0007	.0002	.0001		
50	.6080	.3715	.2281	.1407	.0872	.0543	.0339	.0213	.0134	.0085	.0035	.0014	.0009	.0006	.0003	.0001				
60	.5504	.3048	.1697	.0951	.0535	.0303	.0173	.0099	.0057	.0033	.0011	.0004	.0002	.0001						

* The factor is zero to four decimal places

Present Value of an Annuity of 1 Per Period for n Periods:

$$PVIF_{r,c} = \sum_{t=1}^{n} \frac{1}{(1+r)^t} = \frac{1 - \frac{1}{(1+r)^t}}{r}$$

Number of payments	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.6901	1.6467	1.6257	1.6052	1.5656	1.5278	1.4568	1.3916	1.3315
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1065	1.9813	1.8684	1.7663
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.0373	2.9137	2.8550	2.7982	2.6901	2.5887	2.4043	2.2410	2.0957
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6048	3.4331	3.3522	3.2743	3.1272	2.9906	2.7454	2.5320	2.3452
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.1114	3.8887	3.7845	3.6847	3.4976	3.3255	3.0205	2.7594	2.5342
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.5638	4.2883	4.1604	4.0386	3.8115	3.6046	3.2423	2.9370	2.6775
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	4.9676	4.6389	4.4873	4.3436	4.0776	3.8372	3.4212	3.0758	2.7860
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.3282	4.9464	4.7716	4.6065	4.3030	4.0310	3.5655	3.1842	2.8681
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.6502	5.2161	5.0188	4.8332	4.4941	4.1925	3.6819	3.2689	2.9304
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	5.9377	5.4527	5.2337	5.0286	4.6560	4.3271	3.7757	3.3351	2.9776
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.1944	5.6603	5.4206	5.1971	4.7932	4.4392	3.8514	3.3868	3.0133
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.4235	5.8831	5.5831	5.3423	4.9095	4.5327	3.9124	3.4272	3.0404
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.6282	6.0021	5.7245	5.4675	5.0081	4.6106	3.9616	3.4587	3.0609
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	6.8109	6.1422	5.8474	5.5755	5.0916	4.6755	4.0013	3.4834	3.0764
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	6.9740	6.2651	5.9542	5.6685	5.1624	4.7296	4.0333	3.5026	3.0882
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.1196	6.3729	6.0472	5.7487	5.2223	4.7746	4.0591	3.5177	3.0971
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.2497	6.4674	6.1280	5.8178	5.2732	4.8122	4.0799	3.5294	3.1039
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.3658	6.5504	6.1982	5.8775	5.3162	4.8435	4.0967	3.5386	3.1090
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.4694	6.6231	6.2593	5.9288	5.3527	4.8696	4.1103	3.5458	3.1129
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	7.8431	6.8729	6.4641	6.0971	5.4669	4.9476	4.1474	3.5640	3.1220
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737	9.4269	8.0552	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1242
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574	9.7791	8.2438	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1250
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617	9.9148	8.3045	7.1327	6.6605	6.2463	5.5541	4.9995	4.1666	3.5714	3.1250
60	44.9550	34.7609	27.6756	22.6235	18.9293	16.1614	14.0392	12.3766	11.0480	9.9672	8.3240	7.1401	6.6651	6.2402	5.5553	4.9999	4.1667	3.5714	3.1250

kasneb

CIFA PART III SECTION 5

FIXED INCOME INVESTMENTS ANALYSIS

WEDNESDAY: 28 November 2018.   Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE
(a)   Explain the following terms in relation to bonds secondary market:

   (i)   Off-the-run issue.   (1 mark)

   (ii)   Bond equivalent yield.   (1 mark)

   (iii)   Settlement day.   (1 mark)

   (iv)   Bank discount basis of price quotes.   (1 mark)

(b)   Examine four main features of Eurobonds.   (4 marks)

(c)   Maurine Amwayi, a financial analyst at Nimo Financial Services is researching on the relationship between yield changes and bond price. She has gathered the following information on three bonds; A, B and C trading in the securities exchange.

Bond	Required yield (%)
A	6.8
B	11.0
C	10.0

Each of the above bonds has a par value of Sh.1,000 and offers an annual coupon rate of 10%, paid semi-annually. Each bond matures in 20 years.

Required:
(i)   The price of bonds A, B and C.   (3 marks)

(ii)   Comment on the results obtained in (c) (i) above.   (3 marks)

(d)   An investor buys a 20-year, 9% annual coupon bond for Sh.1,213.55. The bond is callable in 3-years at a call price of Sh.1,090. Assume that the par value of the bond is Sh.1,000.

Required:
(i)   The bond's yield-to-maturity (YTM).   (3 marks)

(ii)   The bond's yield-to-call.   (3 marks)
                                                                                                     (Total: 20 marks)

QUESTION TWO

(a) Describe three ways of characterising a bond. (6 marks)

(b) A fixed income analyst uses the following financial data from the new issue prospectus to calculate credit ratios:

	2016 Sh."000"	2017 Sh."000"
Revenues	20.500	18.700
Operating expenses	18,700	17,100
Depreciation	750	670
Interest	304	257
Taxes	149	135
Net income	597	539
Total debt	4,500	4,425

Required:

(i) Debt-to-earnings before interest, tax, depreciation and amortisation (EBITDA) ratio. (1 mark)

(ii) EBITDA-to-interest coverage ratio. (1 mark)

(iii) Earnings before interest and tax (EBIT) to interest coverage ratio. (1 mark)

(iv) Comment on your results obtained in (b) (i) to (b) (iii) above. (1 mark)

(c) The following information relates to a bond credit ratio score table developed by a rating agency:

Rating at year end

Initial rating	AAA	AA	A	BBB	BB	B	CCC	Default
AAA	93.66	5.83	0.40	0.09	0.03	0.00	0.00	0.00
AA	0.66	91.72	6.94	0.49	0.06	0.09	0.02	0.01
A	0.07	2.25	91.76	5.18	0.49	0.20	0.01	0.04
BBB	0.03	0.26	4.83	89.24	0.44	0.81	0.16	0.24
BB	0.03	0.06	0.44	6.66	83.23	7.46	1.05	1.08
B	0.00	0.10	0.32	0.46	5.72	83.62	3.84	5.94
CCC	0.15	0.00	0.29	0.88	1.91	10.28	61.23	25.26
Default	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100

Required:

(i) Explain the term "credit rating migration". (2 marks)

(ii) The probability that a bond starting with credit rating BBB will drop to a lower rating. (1 mark)

(iii) The probability that a bond whose rating at the beginning of the year is AA will default during the year. (1 mark)

(iv) The probability that a bond initially rated at CCC will remain at CCC at year end. (1 mark)

(d) A-20 year maturity bond with a 10% annual coupon rate currently sells at a yield-to-maturity (YTM) of 9%. An analyst forecasts that 2 years from now, 18-year bonds will sell at a YTM of 8% and that coupon payments can be reinvested in short-term securities over the coming years at a rate of 7% per annum.

Required:
The bond's 2-year return. (5 marks)

(Total: 20 marks)

QUESTION THREE

(a) Differentiate between "static spread" and "option adjusted spread (OAS)". (2 marks)

(b) The following information relates to three bonds:

Bond	Maturities (years)	Coupon rate (%)	Yield-to-maturity (YTM) (%)
1	1	5	4.5
2	2	5	5.0
3	3	0	5.5

Additional information:

1. Each bond has a par value of Sh.100.
2. Coupons are paid annually with the first coupon payment coming in exactly one year from now.
3. The YTM is also quoted as an annual rate.

Required:

(i) The price of a bond with a maturity of 3 years and a coupon rate of 5%. (3 marks)

(ii) The modified duration of a bond portfolio with 30% invested in bond 1 and 70% invested in bond 2. (2 marks)

(iii) Determine by how much the value of the portfolio in (b) (ii) above would change assuming that the yields of all bonds increase by 0.15%. (1 mark)

(iv) Outline three limitations of modified duration. (3 marks)

(c) A semi-annual Sh.1,000 par value floating rate note (FRN) has two years to maturity. The reference rate is 180 day London Interbank offered rate (LIBOR) and the quoted margin is 60 basis point. The 180 day LIBOR today is 3% and the required margin is 86 basis point.

Required:

The value of the floating rate note. (3 marks)

(d) Ann Mwaura gathers the following data relating to a bond that is callable at Sh.101.00 every year starting one year from today.

The binomial interest rate tree (10% volatility assumed) for valuing a 3-year callable bond with a coupon rate of 6.0% is provided below:

Today	Year 1	Year 2	Year 3
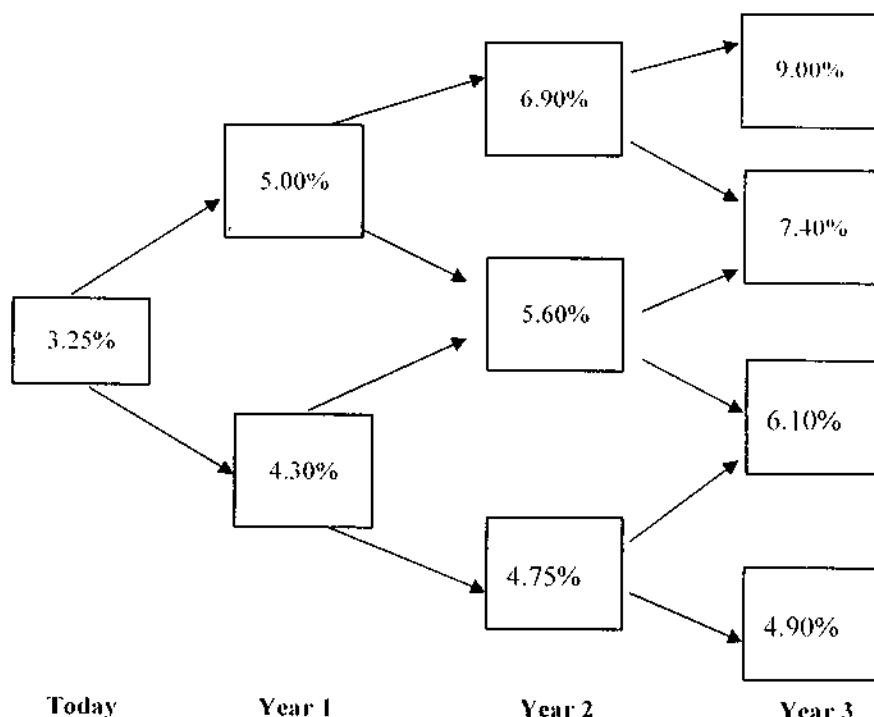
Required:

The value of the callable bond using the interest rate tree above. (6 marks)

(Total: 20 marks)

QUESTION FOUR

(a)   Examine two implications for each of the following term structure of interest rates theories when the yield curve is downward sloping:

    (i)   Pure expectation theory.   (2 marks)

    (ii)   Liquidity preference theory.   (2 marks)

(b)   Citing four reasons, explain why the price of a bond could change over a given period of time.   (8 marks)

(c)   The following prices are available for treasury strips with a principal of 100.

Bond	Maturity year	Price
A	1	95.92
B	2	92.01
C	3	87.00

Required:
Compute the annual forward rate from year two to year three.   (4 marks)

(d)   The following information relates to a certain bond quoted at the securities exchange:

Price as a percentage of par value	Annual coupon rate (%)	Annual period	Maturity (years)
102.6364	4.25	1	1
105.3651	4.75	2	2

Required:
The 2-year spot rate using the bootstrapping method.   (4 marks)
(Total: 20 marks)

QUESTION FIVE

(a)   A bond with a coupon rate of 5.25% and 3 years to maturity has the following forward rates:

Year	One year forward rate (%)
1	3.5
2	4.523
3	5.58

The bond has a par value of Sh.100.

Required:
    (i)   The arbitrage free value of the bond.   (2 marks)

    (ii)   The value of the bond using the spot rate method.   (5 marks)

(b)   Assess three types of event risks that could affect a fixed income instrument.   (6 marks)

(c)   Sabety Amusimbwa, a risk manager at Fanisi Bank is assessing how rating agencies measure sovereign default risks. In particular, she is researching common mistakes made by rating agencies when rating sovereigns and corporations.

Required:
In relation to the above statement, argue four cases against relying on credit agencies in evaluating the creditworthiness of a corporate or sovereign bond.   (4 marks)

(d)   A Sh.1,000 par value bond with 22 years to maturity and a 4% semiannual coupon rate has a yield-to-maturity (YTM) of 5%.

Required:
The convexity of the bond assuming a 5 basis point change in yield.   (3 marks)
(Total: 20 marks)

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Present Value of 1 Received at the End of n Periods:

$$PVIF_{r,n} = 1/(1+r)^n = (1+r)^{-n}$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1	.9901	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9174	.9091	.8929	.8772	.8696	.8621	.8475	.8333	.8065	.7813	.7576	.7353
2	.9803	.9612	.9426	.9246	.9070	.8900	.8734	.8573	.8417	.8264	.7972	.7695	.7561	.7432	.7182	.6944	.6504	.6104	.5739	.5407
3	.9706	.9423	.9151	.8890	.8638	.8396	.8163	.7938	.7722	.7513	.7118	.6750	.6575	.6407	.6086	.5787	.5245	.4768	.4348	.3975
4	.9610	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.7084	.6830	.6355	.5921	.5718	.5523	.5158	.4823	.4230	.3725	.3294	.2923
5	.9515	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6499	.6209	.5674	.5194	.4972	.4761	.4371	.4019	.3411	.2910	.2495	.2149
6	.9420	.8880	.8375	.7903	.7462	.7050	.6663	.6302	.5963	.5645	.5066	.4556	.4323	.4104	.3704	.3349	.2751	.2274	.1890	.1580
7	.9327	.8706	.8131	.7599	.7107	.6651	.6227	.5835	.5470	.5132	.4523	.3996	.3759	.3538	.3139	.2791	.2218	.1776	.1432	.1162
8	.9235	.8535	.7894	.7307	.6768	.6274	.5820	.5403	.5019	.4665	.4039	.3506	.3269	.3050	.2660	.2326	.1789	.1388	.1085	.0854
9	.9143	.8368	.7664	.7026	.6446	.5919	.5439	.5002	.4604	.4241	.3606	.3075	.2843	.2630	.2255	.1938	.1443	.1084	.0822	.0628
10	.9053	.8203	.7441	.6756	.6139	.5584	.5083	.4632	.4224	.3855	.3220	.2697	.2472	.2267	.1911	.1615	.1164	.0847	.0623	.0462
11	.8963	.8043	.7224	.6496	.5847	.5268	.4751	.4289	.3875	.3505	.2875	.2366	.2149	.1954	.1619	.1346	.0938	.0662	.0472	.0340
12	.8874	.7885	.7014	.6246	.5568	.4970	.4440	.3971	.3555	.3186	.2567	.2076	.1869	.1685	.1372	.1122	.0757	.0517	.0357	.0250
13	.8787	.7730	.6810	.6006	.5303	.4688	.4150	.3677	.3262	.2897	.2292	.1821	.1625	.1452	.1163	.0935	.0610	.0404	.0271	.0184
14	.8700	.7579	.6611	.5775	.5051	.4423	.3878	.3405	.2992	.2633	.2046	.1597	.1413	.1252	.0985	.0779	.0492	.0316	.0205	.0135
15	.8613	.7430	.6419	.5553	.4810	.4173	.3624	.3152	.2745	.2394	.1827	.1401	.1229	.1079	.0835	.0649	.0397	.0247	.0155	.0099
16	.8528	.7284	.6232	.5339	.4581	.3936	.3387	.2919	.2519	.2176	.1631	.1229	.1069	.0930	.0708	.0541	.0320	.0193	.0118	.0073
17	.8444	.7142	.6050	.5134	.4363	.3714	.3166	.2703	.2311	.1978	.1456	.1078	.0929	.0802	.0600	.0451	.0258	.0150	.0089	.0054
18	.8360	.7002	.5874	.4936	.4155	.3503	.2959	.2502	.2120	.1799	.1300	.0946	.0808	.0691	.0508	.0376	.0208	.0118	.0068	.0039
19	.8277	.6864	.5703	.4746	.3957	.3305	.2765	.2317	.1945	.1635	.1161	.0829	.0703	.0596	.0431	.0313	.0168	.0092	.0051	.0029
20	.8195	.6730	.5537	.4564	.3769	.3118	.2584	.2145	.1784	.1486	.1037	.0728	.0611	.0514	.0365	.0261	.0135	.0072	.0039	.0021
25	.7798	.6095	.4776	.3751	.2953	.2330	.1842	.1460	.1160	.0923	.0588	.0378	.0304	.0245	.0160	.0105	.0046	.0021	.0010	.0005
30	.7419	.5521	.4120	.3083	.2314	.1741	.1314	.0994	.0754	.0573	.0334	.0196	.0151	.0116	.0070	.0042	.0016	.0006	.0002	.0001
40	.6717	.4529	.3066	.2083	.1420	.0972	.0668	.0460	.0318	.0221	.0107	.0053	.0037	.0026	.0013	.0007	.0002	.0001		
50	.6080	.3715	.2281	.1407	.0872	.0543	.0339	.0213	.0134	.0085	.0035	.0014	.0009	.0006	.0003	.0001				
60	.5504	.3048	.1697	.0951	.0535	.0303	.0173	.0099	.0057	.0033	.0011	.0004	.0002	.0001						

* The factor is zero to four decimal places

Present Value of an Annuity of 1 Per Period for n Periods:

$$PVIF_{r,t} = \sum_{t=1}^{n} \frac{1}{(1+r)^t} = \frac{1 - \frac{1}{(1+r)^n}}{r}$$

Number of payments	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.6901	1.6467	1.6257	1.6052	1.5656	1.5278	1.4568	1.3916	1.3315
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1065	1.9813	1.8684	1.7663
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.0373	2.9137	2.8550	2.7982	2.6901	2.5887	2.4043	2.2410	2.0957
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6048	3.4331	3.3522	3.2743	3.1272	2.9906	2.7454	2.5320	2.3452
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.1114	3.8887	3.7845	3.6847	3.4976	3.3255	3.0205	2.7594	2.5342
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.5638	4.2883	4.1604	4.0386	3.8115	3.6046	3.2423	2.9370	2.6775
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	4.9676	4.6389	4.4873	4.3436	4.0776	3.8372	3.4212	3.0758	2.7860
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.3282	4.9464	4.7716	4.6065	4.3030	4.0310	3.5655	3.1842	2.8681
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.6502	5.2161	5.0188	4.8332	4.4941	4.1925	3.6819	3.2689	2.9304
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	5.9377	5.4527	5.2337	5.0286	4.6560	4.3271	3.7757	3.3351	2.9776
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.1944	5.6603	5.4206	5.1971	4.7932	4.4392	3.8514	3.3868	3.0133
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.4235	5.8424	5.5831	5.3423	4.9095	4.5327	3.9124	3.4272	3.0404
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.6282	6.0021	5.7245	5.4675	5.0081	4.6106	3.9616	3.4587	3.0609
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	6.8109	6.1422	5.8474	5.5755	5.0916	4.6755	4.0013	3.4834	3.0764
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	6.9740	6.2651	5.9542	5.6685	5.1624	4.7296	4.0333	3.5026	3.0882
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.1196	6.3729	6.0472	5.7487	5.2223	4.7746	4.0591	3.5177	3.0971
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.2497	6.4674	6.1280	5.8178	5.2732	4.8122	4.0799	3.5294	3.1039
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.3658	6.5504	6.1982	5.8775	5.3162	4.8435	4.0967	3.5386	3.1090
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.4694	6.6231	6.2593	5.9288	5.3527	4.8696	4.1103	3.5458	3.1129
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	7.8431	6.8729	6.4641	6.0971	5.4669	4.9476	4.1474	3.5640	3.1220
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737	9.4269	8.0552	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1242
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574	9.7791	8.2438	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1250
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617	9.9148	8.3045	7.1327	6.6605	6.2463	5.5541	4.9995	4.1666	3.5714	3.1250
60	44.9550	34.7609	27.6756	22.6235	18.9293	16.1614	14.0392	12.3766	11.0480	9.9672	8.3240	7.1401	6.6651	6.2402	5.5553	4.9999	4.1667	3.5714	3.1250

CIFA PART III SECTION 5

FIXED INCOME INVESTMENTS ANALYSIS

WEDNESDAY: 23 May 2018.   **Time Allowed: 3 hours.**

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE
(a)   With respect to bond indenture:

     (i)   Differentiate between "affirmative bond covenants" and "negative bond covenants".   (2 marks)

     (ii)   Highlight three affirmative bond covenants.   (3 marks)

(b)   Explain three reasons why tenor is important in the bond market.   (3 marks)

(c)   Evaluate three embedded options that could be granted to bond issuers.   (3 marks)

(d)   Best Food Limited has a Sh.10 million outstanding bond issue, carrying a 12% coupon rate with 20 years remaining to maturity. This issue was undertaken 5 years ago and can be called by the company at a premium of 7% above its par value. Currently, new 20-year bonds can be floated at a coupon interest rate of 9% to ensure the availability of funds to pay off the old debt. The new bonds would be sold one month before the old issue is called, so for one month, interest would have to be paid on both issues. Floatation costs, mainly comprising issued and underwriting expenses for the new debt would be Sh.150,000. Currently, short-term interest rates are at 10% per annum. Best Food Limited's marginal tax rate is 30%.

     Required:
     Advise the management on whether to refinance the bond.   (9 marks)
                           (Total: 20 marks)

QUESTION TWO
(a)   Analyse two types of credit risk that a bond investor could be exposed to.   (2 marks)

(b)   (i)   Assess two bond features that would affect the interest rate risk of a bond.   (2 marks)

     (ii)   Evaluate two benefits of using swap rate curve compared to government bond yield curve in fixed income valuation.   (2 marks)

(c) The binomial interest rate tree for valuing a putable corporate bond with three years to maturity and a coupon rate of 5.25% putable in one year at Sh.100 is provided below:


```
                              ┌─────────┐
                              │ 6.757%  │
                   ┌─────────┐ └─────────┘
                   │ 4.976%  │
                   └─────────┘
                              ┌─────────┐
                              │ 5.532%  │
     ┌─────────┐              └─────────┘
     │ 3.500%  │
     └─────────┘ ┌─────────┐
                 │ 4.074%  │
                 └─────────┘
                              ┌─────────┐
                              │ 4.530%  │
                              └─────────┘

   Year 1        Year 2        Year 3
```
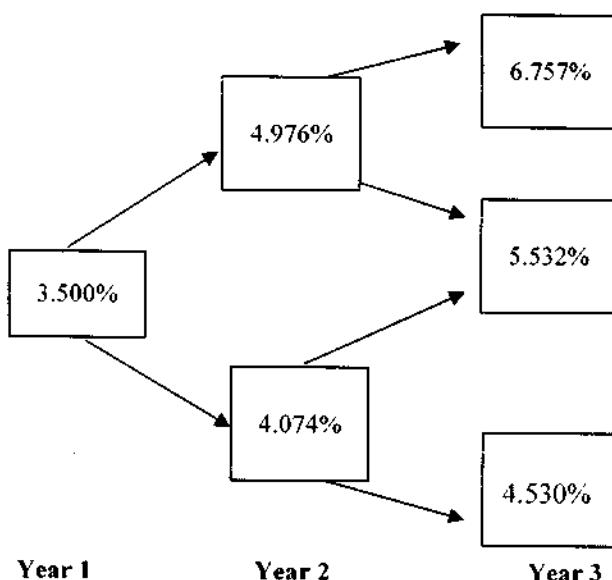
Required:
The value of the putable bond. (6 marks)

(d) A fixed income analyst is asked to rank three bonds; A, B and C in terms of interest rate risk. The interest rate risk here means the potential price decrease on a percentage basis given a sudden change in financial market conditions.

The increases in the yield-to-maturity represent the "worst case" for the scenario being considered:

Bond	Modified Duration	Convexity	Change in yield (Basis points)
A	3.72	12.10	25
B	5.81	40.70	15
C	12.39	158.0	10

Additional information:
1. The modified duration and convexity statistics are annualised.
2. The change in yield is the increase in the annual yield-to-maturity.

Required:
Determine the bond with the highest interest rate risk. (4 marks)

(e) A 15-year deferred coupon bond has a face value of Sh.1,000. The bond is yielding 7% annually and selling for Sh.926.21 at the secondary bond markets. The deferred period is the first 5 years in the life of the bond. After the deferred period, the issuer is expected to pay a percentage of the par value annually as the coupon until maturity. The first coupon payment occurs one year after the end of the deferred period.

Required:
Calculate the coupon rate of the deferred coupon bond. (4 marks)
(Total: 20 marks)

QUESTION THREE
(a) In relation to credit analysis models:

    (i) Differentiate between "structured model" and "reduced form model". (2 marks)

    (ii) Discuss three models that could be used in evaluating credit risk of a fixed income security. (3 marks)

(b) A bond is purchased between coupon periods. The number of days between the settlement date and the next coupon payment is 45 days. There are 360 days in the coupon period. The bond has a face value of Sh.1,000 and a coupon rate of 12%. There are 5 annual coupon payments remaining. The discount rate is 10%.

Required:

(i) The clean price of the bond. (3 marks)

(ii) The dirty price of the bond. (2 marks)

(c) A bond issued by your country has the following features:

Par value   Sh.1,000
Coupon rate   8%
Tenor   10 years

The bond market yield is 10% and the interest is payable annually. The spot market yields over the term of the bond are provided below:

Year	Rate (%)
1	10.0
2	10.5
3	11.0
4	12.0
5	12.5
6	12.75
7	13.0
8	13.25
9	13.5
10	13.75

Required:

(i) The value of the bond using the traditional valuation approach. (3 marks)

(ii) The value of the bond using the arbitrage-free valuation approach. (5 marks)

(iii) Comment on the results obtained in (c) (i) and (c) (ii) above. (2 marks)
(Total: 20 marks)

QUESTION FOUR

(a) Discuss two theories relating to the term structure of interest rates. (4 marks)

(b) A bank based in the United States (US) and a German Industrial Company have issued a Sh.50 million, 180-day, 5% commercial paper. The US bank has issued its commercial paper domestically and the German Industrial Company has issued Eurocommercial paper.

Required:

(i) Calculate the rate of return on the US commercial paper. (2 marks)

(ii) Calculate the rate of return on the Eurocommercial paper. (2 marks)

(c) Tumtum Ltd. has issued an 8% bond which has a face value of Sh.100 and a premium of 2% on redemption in three years time. The coupon on the bond is payable on an annual basis. The government has three bonds in issue. They all have a face value of Sh.100 and are redeemable at par. They are of the same risk class and the coupon on each bond is payable annually.

The following information relates to the three government bonds:

Bond	Redeemable period (years)	Coupon %	Current market value (Sh.)
1	1	9	104
2	2	7	102
3	3	6	98

Tumtum Ltd. is downgraded by the rating agencies from a credit rating of grade AA to BBB.

The credit spreads published by the credit rating agency are as follows (in basis points)

Rating	1 year	2 years	3 years
AA	18	31	45
BBB	54	69	86

Required:

(i)   The value of Tumtum Ltd.'s bond under its old and new credit rating.   (7 marks)

(ii)   The yield-to-maturity (YTM) of Tumtum Ltd.'s bond under its old and new credit rating.   (5 marks)

                                                                           (Total: 20 marks)

QUESTION FIVE

(a)   Illustrate four areas that a credit rating agency should focus on when assessing credit risk of a country intending to issue a sovereign bond.   (4 marks)

(b)   A 365-day year bank certificate of deposit has an initial principal amount of Sh.96.5 million and a redemption amount due at maturity of Sh.100 million. The number of days between settlement and maturity is 350.

      Required:
      The bond equivalent yield.   (3 marks)

(c)   A bond that pays coupons annually is issued with a coupon rate of 4%. The bond has a par value of Sh.1,000, maturity period of 30 years and a yield-to-maturity of 8%. After one year, the yield-to-maturity is expected to be 9%.

      Required:
      The rate of return earned by an investor who holds the bond for a period of one year.   (4 marks)

(d)   An analyst identifies two corporate bonds that have similar credit quality as a four-year, 4.5% annual coupon payment corporate bond which is illiquid. One bond is a three-year, 5.5% annual coupon bond priced at Sh.107.5 per Sh.100 of par value and the other is a five-year, 4.5% annual coupon bond priced at Sh.104.75 per Sh.100 of par value.

      Required:
      The estimated price of the illiquid bond per Sh.100 of par value.   (5 marks)

(e)   An investor buys a three-year bond with a 5% coupon rate payable annually. The bond, with a yield-to-maturity of 3%, is purchased at a price of Sh.105.657223 per Sh.100 of par value.

      Required:
      Assuming a 5 basis point change in the yield, compute the bond's approximate modified duration.   (4 marks)

                                                                           (Total: 20 marks)

....

Present Value of 1 Received at the End of n Periods:

$$PVIF_{r,n} = 1/(1+r)^n = (1+r)^{-n}$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1	.9901	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9174	.9091	.8929	.8772	.8696	.8621	.8475	.8333	.8065	.7813	.7576	.7353
2	.9803	.9612	.9426	.9246	.9070	.8900	.8734	.8573	.8417	.8264	.7972	.7695	.7561	.7432	.7182	.6944	.6504	.6104	.5739	.5407
3	.9706	.9423	.9151	.8890	.8638	.8396	.8163	.7938	.7722	.7513	.7118	.6750	.6575	.6407	.6086	.5787	.5245	.4768	.4348	.3975
4	.9610	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.7084	.6830	.6355	.5921	.5718	.5523	.5158	.4823	.4230	.3725	.3294	.2923
5	.9515	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6499	.6209	.5674	.5194	.4972	.4761	.4371	.4019	.3411	.2910	.2495	.2149
6	.9420	.8880	.8375	.7903	.7462	.7050	.6663	.6302	.5963	.5645	.5066	.4556	.4323	.4104	.3704	.3349	.2751	.2274	.1890	.1580
7	.9327	.8706	.8131	.7599	.7107	.6651	.6227	.5835	.5470	.5132	.4523	.3996	.3759	.3538	.3139	.2791	.2218	.1776	.1432	.1162
8	.9235	.8535	.7894	.7307	.6768	.6274	.5820	.5403	.5019	.4665	.4039	.3506	.3269	.3050	.2660	.2326	.1789	.1388	.1085	.0854
9	.9143	.8368	.7664	.7026	.6446	.5919	.5439	.5002	.4604	.4241	.3606	.3075	.2843	.2630	.2255	.1938	.1443	.1084	.0822	.0628
10	.9053	.8203	.7441	.6756	.6139	.5584	.5083	.4632	.4224	.3855	.3220	.2697	.2472	.2267	.1911	.1615	.1164	.0847	.0623	.0462
11	.8963	.8043	.7224	.6496	.5847	.5268	.4751	.4289	.3875	.3505	.2875	.2366	.2149	.1954	.1619	.1346	.0938	.0662	.0472	.0340
12	.8874	.7885	.7014	.6246	.5568	.4970	.4440	.3971	.3555	.3186	.2567	.2076	.1869	.1685	.1372	.1122	.0757	.0517	.0357	.0250
13	.8787	.7730	.6810	.6006	.5303	.4688	.4150	.3677	.3262	.2897	.2292	.1821	.1625	.1452	.1163	.0935	.0610	.0404	.0271	.0184
14	.8700	.7579	.6611	.5775	.5051	.4423	.3878	.3405	.2992	.2633	.2046	.1597	.1413	.1252	.0985	.0779	.0492	.0316	.0205	.0135
15	.8613	.7430	.6419	.5553	.4810	.4173	.3624	.3152	.2745	.2394	.1827	.1401	.1229	.1079	.0835	.0649	.0397	.0247	.0155	.0099
16	.8528	.7284	.6232	.5339	.4581	.3936	.3387	.2919	.2519	.2176	.1631	.1229	.1069	.0930	.0708	.0541	.0320	.0193	.0118	.0073
17	.8444	.7142	.6050	.5134	.4363	.3714	.3166	.2703	.2311	.1978	.1456	.1078	.0929	.0802	.0600	.0451	.0258	.0150	.0089	.0054
18	.8360	.7002	.5874	.4936	.4155	.3503	.2959	.2502	.2120	.1799	.1300	.0946	.0808	.0691	.0508	.0376	.0208	.0118	.0068	.0039
19	.8277	.6864	.5703	.4746	.3957	.3305	.2765	.2317	.1945	.1635	.1161	.0829	.0703	.0596	.0431	.0313	.0168	.0092	.0051	.0029
20	.8195	.6730	.5537	.4564	.3769	.3118	.2584	.2145	.1784	.1486	.1037	.0728	.0611	.0514	.0365	.0261	.0135	.0072	.0039	.0021
25	.7798	.6095	.4776	.3751	.2953	.2330	.1842	.1460	.1160	.0923	.0588	.0378	.0304	.0245	.0160	.0105	.0046	.0021	.0010	.0005
30	.7419	.5521	.4120	.3083	.2314	.1741	.1314	.0994	.0754	.0573	.0334	.0196	.0151	.0116	.0070	.0042	.0016	.0006	.0002	.0001
40	.6717	.4529	.3066	.2083	.1420	.0972	.0668	.0460	.0318	.0221	.0107	.0053	.0037	.0026	.0013	.0007	.0002	.0001		
50	.6080	.3715	.2281	.1407	.0872	.0543	.0339	.0213	.0134	.0085	.0035	.0014	.0009	.0006	.0003	.0001				
60	.5504	.3048	.1697	.0951	.0535	.0303	.0173	.0099	.0057	.0033	.0011	.0004	.0002	.0001						

* The factor is zero to four decimal places

Present Value of an Annuity of 1 Per Period for n Periods:

$$PVIF_{r,n} = \sum_{t=1}^{n} \frac{1}{(1+r)^t} = \frac{1 - \frac{1}{(1+r)^n}}{r}$$

Number of payments	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.6901	1.6467	1.6257	1.6052	1.5656	1.5278	1.4568	1.3916	1.3315
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1065	1.9813	1.8684	1.7663
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.0373	2.9137	2.8550	2.7982	2.6901	2.5887	2.4043	2.2410	2.0957
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6048	3.4331	3.3522	3.2743	3.1272	2.9906	2.7454	2.5320	2.3452
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.1114	3.8887	3.7845	3.6847	3.4976	3.3255	3.0205	2.7594	2.5342
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.5638	4.2883	4.1604	4.0386	3.8115	3.6046	3.2423	2.9370	2.6775
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	4.9676	4.6389	4.4873	4.3436	4.0776	3.8372	3.4212	3.0758	2.7860
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.3282	4.9464	4.7716	4.6065	4.3030	4.0310	3.5655	3.1842	2.8681
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.6502	5.2161	5.0188	4.8332	4.4941	4.1925	3.6819	3.2689	2.9304
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	5.9377	5.4527	5.2337	5.0286	4.6560	4.3271	3.7757	3.3351	2.9776
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.1944	5.6603	5.4206	5.1971	4.7932	4.4392	3.8514	3.3868	3.0133
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.4235	5.8424	5.5831	5.3423	4.9095	4.5327	3.9124	3.4272	3.0404
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.6282	6.0021	5.7245	5.4675	5.0081	4.6106	3.9616	3.4587	3.0609
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	6.8109	6.1422	5.8474	5.5755	5.0916	4.6755	4.0013	3.4834	3.0764
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	6.9740	6.2651	5.9542	5.6685	5.1624	4.7296	4.0333	3.5026	3.0882
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.1196	6.3729	6.0472	5.7487	5.2223	4.7746	4.0591	3.5177	3.0971
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.2497	6.4674	6.1280	5.8178	5.2732	4.8122	4.0799	3.5294	3.1039
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.3658	6.5504	6.1982	5.8775	5.3162	4.8435	4.0967	3.5386	3.1090
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.4694	6.6231	6.2593	5.9288	5.3527	4.8696	4.1103	3.5458	3.1129
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	7.8431	6.8729	6.4641	6.0971	5.4669	4.9476	4.1474	3.5640	3.1220
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737	9.4269	8.0552	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1242
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574	9.7791	8.2438	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1250
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617	9.9148	8.3045	7.1327	6.6605	6.2463	5.5541	4.9995	4.1666	3.5714	3.1250
60	44.9550	34.7609	27.6756	22.6235	18.9293	16.1614	14.0392	12.3766	11.0480	9.9672	8.3240	7.1401	6.6651	6.2402	5.5553	4.9999	4.1667	3.5714	3.1250

kasneb

CIFA PART III SECTION 5

FIXED INCOME INVESTMENTS ANALYSIS

WEDNESDAY: 29 November 2017.   Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE
(a)   Explain the following types of sovereign bonds:

     (i)   Fixed-rate bonds.   (1 mark)

     (ii)   Floating-rate bonds.   (1 mark)

     (iii) Inflation-linked bonds.   (1 mark)

(b)   Summarise three factors that could affect the interest rate on a repurchase agreement (repo) rate transaction. (3 marks)

(c)   Emase Omanyala, an investor, buys a 4-year, 10% annual coupon payment bond with a yield-to-maturity of 5%. Emase intends to sell the bond in two years time once the second coupon payment is received. The coupon reinvestment rate after the bond purchase and the yield-to-maturity at the time of sale is 3%. The face value of the bond is Sh.100.

Required:
     (i)   The purchase price for the bond.   (2 marks)

     (ii)   The horizon yield.   (3 marks)

(d)   A bond trader is provided with the following information relating to three bonds with annual coupon payments and a par value of Sh.100.

Bond	Coupon payment (Sh.)	Maturity (years)	Yield -to-maturity (%)
X	0	1	5.00
Y	5	2	5.20
Z	6	3	6.00

Required:
     (i)   Determine the current term structure of spot interest rates.   (3 marks)

     (ii)   Illustrate how you would synthetically replicate a zero-coupon bond with a maturity of 3 years and a par value of Sh.100.   (3 marks)

     (iii) Calculate the no-arbitrage price of the bond.   (3 marks)
                                                                                   (Total: 20 marks)

QUESTION TWO
(a)   Explain the following terms as used in valuation of fixed-income instruments:

     (i)   Spot curve.   (2 marks)
     (ii)   Par curve.   (2 marks)
     (iii) Forward curve.   (2 marks)

(b)   Your national government intends to issue a sovereign bond. As a fixed income professional, you have been consulted to advise on the issue.

Required:

Advise the treasury of your national government on three key areas that should be included in the basic framework for evaluating and assigning a credit rating of your national government before issuing the sovereign bond. (3 marks)

(c) A corporate bond offers a 5% coupon rate and has exactly 3 years remaining to maturity. Interest is paid annually.

The following rates are available from the benchmark spot curve:

Time-to-maturity (years)	Spot rate (%)
1	4.86
2	4.95
3	5.65

The bond is currently trading at a Z - spread of 234 basis points and has a par value of Sh.100.

Required:
The value of the corporate bond. (4 marks)

(d) Peter Mutuku, an investor, buys a three-year bond with a 5% coupon rate paid annually. The bond, with a yield-to-maturity of 3%, is purchased at a price of Sh.105.657223 per Sh.100 of the face value.

Required:
Calculate the bond's approximate modified duration assuming a 5 basis points change in yield-to-maturity (YTM).
(7 marks)
(Total: 20 marks)

QUESTION THREE

(a) Analyse three risks associated with relying on credit rating agencies when investing in fixed-income securities.
(6 marks)

(b) Credit risk analysis is extremely important to a well-functioning economy. Financial crises often originate in the mis-measuring of, and changes in, credit risk. Mis-rating can result in mispricing and misallocation of resources.

Required:
In relation to the above statements, discuss four credit risk measures of a bond. (8 marks)

(c) The following information relates to three newly issued AAA rated bonds:

Bond characteristics

	Bond A	Bond B	Bond C
Coupon	7%	7%	7%
Maturity date	August 3, 2021	August 3, 2021	August 3, 2021
Modified duration	4.15	4.17	4.16
Standard convexity	0.21	0.21	0.21

Effective duration and effective convexity for various shifts in the term structure

Term	Bond A		Bond B		Bond C	
Structure shift (basis points)	Effective Duration	Effective Convexity	Effective Duration	Effective Convexity	Effective Duration	Effective Convexity
−500	0.49	0.47	4.35	22.65	4.34	22.51
−300	0.49	0.47	4.28	22.04	4.27	21.86
−100	0.48	0.48	4.20	21.56	4.18	21.18
+100	4.11	20.57	0.48	0.47	4.12	20.66
+300	4.04	19.98	0.48	0.44	4.05	20.03
+500	3.97	19.35	0.47	0.44	3.98	19.45

**Required:**
Justifying your answer, identify the:

(i)   Puttable bond.   (2 marks)

(ii)   Callable bond.   (2 marks)

(iii)   Option-free bond.   (2 marks)
(Total: 20 marks)

QUESTION FOUR

(a)   Discuss three characteristics shared by equilibrium term structure models.   (6 marks)

(b)   Highlight two methods that could be used to estimate interest rate volatility.   (2 marks)

(c)   Describe three factors that could influence the level and volatility of yield spreads on corporate bonds.   (3 marks)

(d)   The following information relates to a step-up coupon callable bond:

Today (Year 0)   (Year 1)   (Year 2)   (Year 3)   (Year 4)
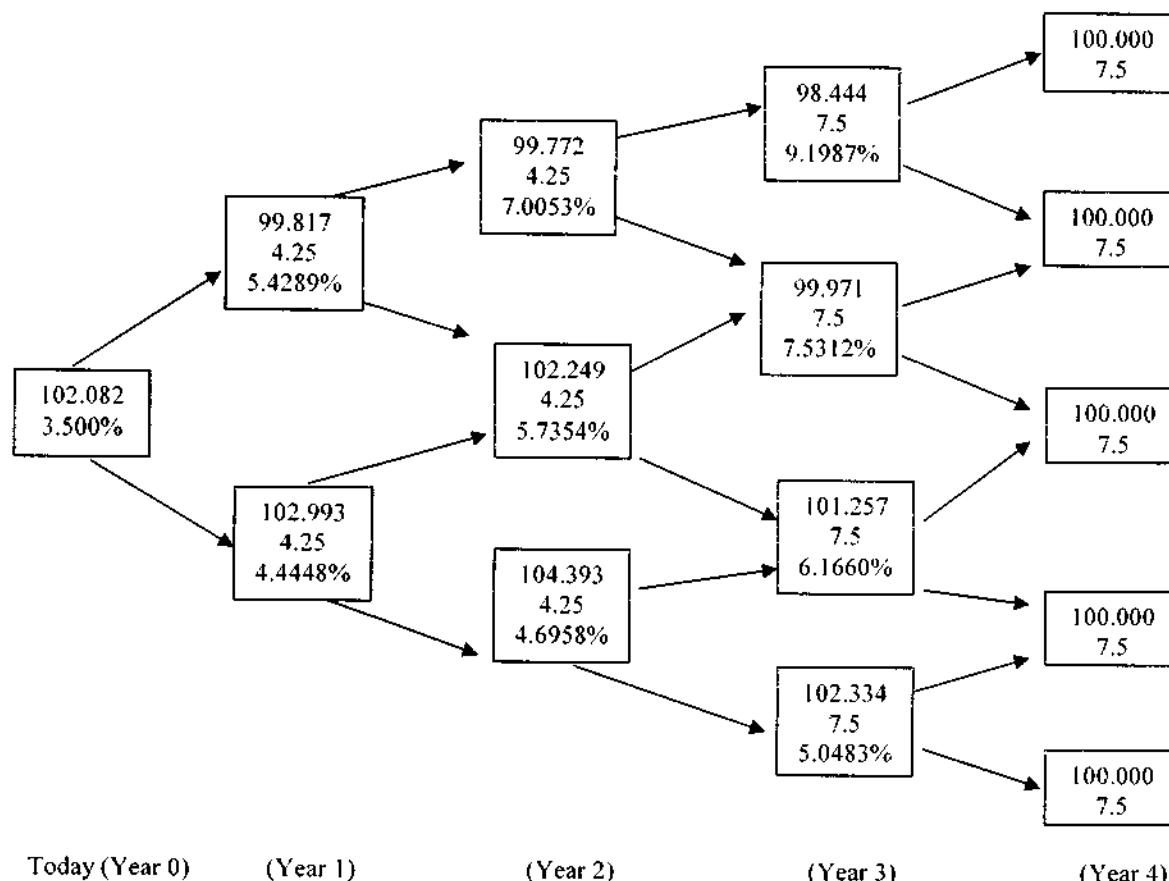
Additional information:
1.   Step-up: 4.25% for year 1 and 2 and 7.50% for year 3 and 4.
2.   Computed value: Coupon based on step-up schedule short-term rate (r)
3.   The four-year step-up callable note pays 4.25% for two years and then 7.5% for two more years. This note is callable at par at the end of year 2 and year 3. It is assumed that interest rate volatility is 10%.

Required:
Determine the value of the embedded call option.   (9 marks)
(Total: 20 marks)

QUESTION FIVE

(a) (i) Define the term "credit enhancement" as used in a bond issue. (1 mark)

(ii) Distinguish between "internal credit enhancement" and "external credit enhancement". (2 marks)

(iii) Examine three forms of external credit enhancement. (3 marks)

(b) Describe three types of bonds with embedded options. (6 marks)

(c) The following information relates to three bonds A, B and C listed at MSE securities exchange:

Bond	Coupon (%)	Maturity (Years)	Price (%)
A	5	1	100.96
B	6.5	3	106.29
C	2	3	93.84

Additional information:
1. Prices are in decimals.
2. The bonds' pay coupon annually.
3. The par value of each bond is Sh.100.

Required:

(i) The yield-to-maturity (YTM) for each bond. (3 marks)

(ii) The 1-year, 2-year and 3-year spot rates. (5 marks)

(Total: 20 marks)

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Present Value of 1 Received at the End of n Periods:

$$\text{PVIF}_{r,n} = 1/(1+r)^n = (1+r)^{-n}$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1	.9901	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9174	.9091	.8929	.8772	.8696	.8621	.8475	.8333	.8065	.7813	.7576	.7353
2	.9803	.9612	.9426	.9246	.9070	.8900	.8734	.8573	.8417	.8264	.7972	.7695	.7561	.7432	.7182	.6944	.6504	.6104	.5739	.5407
3	.9706	.9423	.9151	.8890	.8638	.8396	.8163	.7938	.7722	.7513	.7118	.6750	.6575	.6407	.6086	.5787	.5245	.4768	.4348	.3975
4	.9610	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.7084	.6830	.6355	.5921	.5718	.5523	.5158	.4823	.4230	.3725	.3294	.2923
5	.9515	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6499	.6209	.5674	.5194	.4972	.4761	.4371	.4019	.3411	.2910	.2495	.2149
6	.9420	.8880	.8375	.7903	.7462	.7050	.6663	.6302	.5963	.5645	.5066	.4556	.4323	.4104	.3704	.3349	.2751	.2274	.1890	.1580
7	.9327	.8706	.8131	.7599	.7107	.6651	.6227	.5835	.5470	.5132	.4523	.3996	.3759	.3538	.3139	.2791	.2218	.1776	.1432	.1162
8	.9235	.8535	.7894	.7307	.6768	.6274	.5820	.5403	.5019	.4665	.4039	.3506	.3269	.3050	.2660	.2326	.1789	.1388	.1085	.0854
9	.9143	.8368	.7664	.7026	.6446	.5919	.5439	.5002	.4604	.4241	.3606	.3075	.2843	.2630	.2255	.1938	.1443	.1084	.0822	.0628
10	.9053	.8203	.7441	.6756	.6139	.5584	.5083	.4632	.4224	.3855	.3220	.2697	.2472	.2267	.1911	.1615	.1164	.0847	.0623	.0462
11	.8963	.8043	.7224	.6496	.5847	.5268	.4751	.4289	.3875	.3505	.2875	.2366	.2149	.1954	.1619	.1346	.0938	.0662	.0472	.0340
12	.8874	.7885	.7014	.6246	.5568	.4970	.4440	.3971	.3555	.3186	.2567	.2076	.1869	.1685	.1372	.1122	.0757	.0517	.0357	.0250
13	.8787	.7730	.6810	.6006	.5303	.4688	.4150	.3677	.3262	.2897	.2292	.1821	.1625	.1452	.1163	.0935	.0610	.0404	.0271	.0184
14	.8700	.7579	.6611	.5775	.5051	.4423	.3878	.3405	.2992	.2633	.2046	.1597	.1413	.1252	.0985	.0779	.0492	.0316	.0205	.0135
15	.8613	.7430	.6419	.5553	.4810	.4173	.3624	.3152	.2745	.2394	.1827	.1401	.1229	.1079	.0835	.0649	.0397	.0247	.0155	.0099
16	.8528	.7284	.6232	.5339	.4581	.3936	.3387	.2919	.2519	.2176	.1631	.1229	.1069	.0930	.0708	.0541	.0320	.0193	.0118	.0073
17	.8444	.7142	.6050	.5134	.4363	.3714	.3166	.2703	.2311	.1978	.1456	.1078	.0929	.0802	.0600	.0451	.0258	.0150	.0089	.0054
18	.8360	.7002	.5874	.4936	.4155	.3503	.2959	.2502	.2120	.1799	.1300	.0946	.0808	.0691	.0508	.0376	.0208	.0118	.0068	.0039
19	.8277	.6864	.5703	.4746	.3957	.3305	.2765	.2317	.1945	.1635	.1161	.0829	.0703	.0596	.0431	.0313	.0168	.0092	.0051	.0029
20	.8195	.6730	.5537	.4564	.3769	.3118	.2584	.2145	.1784	.1486	.1037	.0728	.0611	.0514	.0365	.0261	.0135	.0072	.0039	.0021
25	.7798	.6095	.4776	.3751	.2953	.2330	.1842	.1460	.1160	.0923	.0588	.0378	.0304	.0245	.0160	.0105	.0046	.0021	.0010	.0005
30	.7419	.5521	.4120	.3083	.2314	.1741	.1314	.0994	.0754	.0573	.0334	.0196	.0151	.0116	.0070	.0042	.0016	.0006	.0002	.0001
40	.6717	.4529	.3066	.2083	.1420	.0972	.0668	.0460	.0318	.0221	.0107	.0053	.0037	.0026	.0013	.0007	.0002	.0001		
50	.6080	.3715	.2281	.1407	.0872	.0543	.0339	.0213	.0134	.0085	.0035	.0014	.0009	.0006	.0003	.0001				
60	.5504	.3048	.1697	.0951	.0535	.0303	.0173	.0099	.0057	.0033	.0011	.0004	.0002	.0001						

* The factor is zero to four decimal places

Present Value of an Annuity of 1 Per Period for n Periods:

$$\text{PVIF}_{r,t} = \sum_{t=1}^{n} \frac{1}{(1+r)^t} = \frac{1 - \dfrac{1}{(1+r)^n}}{r}$$

Number of payments	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.6901	1.6467	1.6257	1.6052	1.5656	1.5278	1.4568	1.3916	1.3315
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1065	1.9813	1.8684	1.7663
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.0373	2.9137	2.8550	2.7982	2.6901	2.5887	2.4043	2.2410	2.0957
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6048	3.4331	3.3522	3.2743	3.1272	2.9906	2.7454	2.5320	2.3452
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.1114	3.8887	3.7845	3.6847	3.4976	3.3255	3.0205	2.7594	2.5342
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.5638	4.2883	4.1604	4.0386	3.8115	3.6046	3.2423	2.9370	2.6775
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	4.9676	4.6389	4.4873	4.3436	4.0776	3.8372	3.4212	3.0758	2.7860
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.3282	4.9464	4.7716	4.6065	4.3030	4.0310	3.5655	3.1842	2.7860
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.6502	5.2161	5.0188	4.8332	4.4941	4.1925	3.6819	3.2689	2.9304
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	5.9377	5.4527	5.2337	5.0286	4.6560	4.3271	3.7757	3.3351	2.9776
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.1944	5.6603	5.4206	5.1971	4.7932	4.4392	3.8514	3.3868	3.0133
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.4235	5.8424	5.5831	5.3423	4.9095	4.5327	3.9124	3.4272	3.0404
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.6282	6.0021	5.7245	5.4675	5.0081	4.6106	3.9616	3.4587	3.0609
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	6.8109	6.1422	5.8474	5.5755	5.0916	4.6755	4.0013	3.4834	3.0764
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	6.9740	6.2651	5.9542	5.6685	5.1624	4.7296	4.0333	3.5026	3.0882
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.1196	6.3729	6.0472	5.7487	5.2223	4.7746	4.0591	3.5177	3.0971
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.2497	6.4674	6.1280	5.8178	5.2732	4.8122	4.0799	3.5294	3.1039
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.3658	6.5504	6.1982	5.8775	5.3162	4.8435	4.0967	3.5386	3.1039
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.4694	6.6231	6.2593	5.9288	5.3527	4.8696	4.1103	3.5458	3.1129
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	7.8431	6.8729	6.4641	6.0971	5.4669	4.9476	4.1474	3.5640	3.1220
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737	9.4269	8.0552	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1220
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574	9.7791	8.2438	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1242
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617	9.9148	8.3045	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1250
60	44.9550	34.7609	27.6756	22.6235	18.9293	16.1614	14.0392	12.3766	11.0480	9.9672	8.3240	7.1401	6.6651	6.2402	5.5553	4.9999	4.1667	3.5714	3.1250

KASNEB

CIFA PART III SECTION 5

FIXED INCOME INVESTMENTS ANALYSIS

WEDNESDAY: 24 May 2017.   Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE

(a) Highlight three sources of return on a fixed-rate bond purchased at par.   (3 marks)

(b) In the context of bond duration, explain the following terms:

    (i)   Yield duration.   (1 mark)

    (ii)   Curve duration.   (1 mark)

    (iii)   Macaulay duration.   (1 mark)

    (iv)   Modified duration.   (1 mark)

    (v)   Key rate duration.   (1 mark)

    (vi)   Money duration.   (1 mark)

(c) Assess two effects of change in volatility on a callable convertible bond.   (2 marks)

(d) A treasury bond pays a 12% coupon annually. The bond has 80 days to the next coupon payment and there are 285 days since the last coupon payment. After the next coupon payment, the bond will have six years to maturity. The current market yield for the bond is 10%.

    Required:
    The bond's clean price.   (5 marks)

(e) A corporate bond with a coupon rate of 4% and a par value of Sh.1,000 was purchased for Sh.840 one year ago. The bond was sold for Sh.894. The inflation rate during the year was 5%.

    Required:
    The real return for the corporate bond.   (4 marks)
                                      (Total: 20 marks)

QUESTION TWO

(a) Daniel Mutiso is a fixed income analyst with Bidii Investment Bank Ltd. The Chief Investment Officer has instructed him to value a 30-year bond using Monte Carlo simulation method.

    Required:
    Assuming that the bond has monthly coupon payments, enumerate five steps that Daniel Mutiso would follow when valuing the bond.   (5 marks)

(b) Maxica Ltd. is a listed company based in Nairobi. The market value of the company's assets is Sh.100 million. The company also has a 1-year debt with a par value of Sh.70 million. The risk-free rate is 5% and the volatility of asset value is 40%. The company uses Black-Scholes model to estimate the probability of default.

    Required:
    The probability of default for the 1-year debt.   (6 marks)

    Hint: Probability of default $= 1 - N(d_2)$

$$\text{Where: } d_1 = \frac{\ln\left(\frac{S_0}{E}\right) + \left(r_f + \frac{1}{2}\sigma^2\right)t}{\sigma\sqrt{t}}$$

$d_2 = d_1 - \sigma\sqrt{t}$

S_0 is the market price of underlying stock.

E is the exercise price

r_f is the risk-free rate.

σ is the volatility of security prices.

t is the maturity period.

(c) In March 2016, Double Communications Ltd. (DCL) issued Sh.575 million senior convertible bond with 6.25% annual coupon and a 5-year maturity period. Each Sh.1,000 par value bond could be converted into 16.1421 (dividend adjusted for a 2:1 split that occurred in July 2016) shares of DCL ordinary shares.

In March 2017, the bond traded at 121% (bond points in percent of the par amount) and the DCL ordinary shares traded at Sh.65 per share. The share pays no dividend.

Required:

The premium payback period. (3 marks)

(d) Samuel Kyalo is considering purchasing one of the following newly issued 10-year AAA rated corporate bonds on 30 April 2017 whose characteristics are shown below:

Bond description	Coupon rate (%)	Price (Sh.)	Call option	Call price (Sh.)
Bond X due 30 April 2027	6.00	100	Non-callable	Not applicable
Bond Y due 30 April 2027	6.20	100	Currently callable	102.00

Samuel Kyalo notes that the yield curve is currently flat and assumes that the yield curve shifts in an instantaneous and parallel manner.

Required:

(i) Contrast the effect on the price of bond X and bond Y assuming yields decline more than 100 basis points. (3 marks)

(ii) Explain two interest rate forecasts under which Samuel Kyalo would prefer bond Y over bond X. (3 marks)

(Total: 20 marks)

QUESTION THREE

(a) Propose three limitations of Macaulay and modified durations. (3 marks)

(b) Explain three areas considered in the credit analysis of asset backed securities (ABS) and corporate bonds. (3 marks)

(c) A 3-year bond has a coupon of 12% and a yield-to-maturity (YTM) of 9%. The bond pays interest on an annual basis.

Required:

Compute the bond convexity. (7 marks)

(d) A fund manager has the following three bond portfolio:

Bond description	Price (Sh.)	Yield (%)	Par amount owed (Sh.)	Duration
10%, 5 year	100	10	4 million	3.86
8%, 15 year	84.63	10	5 million	8.05
14%, 30 year	137.86	10	1 million	9.17

The three bonds are option-free.

Required:

(i) The bond portfolio duration. (6 marks)

(ii) Interpret the result obtained in (d)(i) above. (1 mark)

(Total: 20 marks)

QUESTION FOUR

(a)   Describe two advantages of a bond sinking fund from the bondholders perspective.   (2 marks)

(b)   Explain how the following factors could be used to describe the yield curve movements as postulated by Litterman and Scheinkman (1991).

         (i)   Level of the yield curve.   (1 mark)

         (ii)   Slope of the yield curve.   (1 mark)

         (iii)   Curvature of the yield curve.   (1 mark)

(c)   Outline three disadvantages of a bond call provision from the investors perspective.   (3 marks)

(d)   The yield curve of a bond portfolio shifts such that 2-year rates increase by 50 basis points, 10-year rates increase by 100 basis points, 20-year rates increase by 80 basis points and 25-year rates decline by 120 basis points. The key rate duration for the 2-year, 10-year, 20-year and 25-year bonds are 0.5, 2.5, 9 and 10 respectively.

Required:
Calculate the effect of this non-parallel shift in the yield curve on the bond portfolio.   (4 marks)

(e)   The spot rates for year 1, year 2 and year 3 are 3.5%, 4% and 4.5% respectively. There is a 3-year zero-coupon bond and a 3-year coupon bond that pays a 5% coupon annually.

Required:

         (i)   The bonds yield-to-maturity (YTM).   (3 marks)

         (ii)   The realised return of the two bonds over the next one year if the yield curve remains constant.   (5 marks)

     (Total: 20 marks)

QUESTION FIVE

(a)   (i)   Evaluate six methods of classifying global fixed income markets.   (6 marks)

         (ii)   Examine two mechanisms for issuing bonds in the primary markets.   (2 marks)

(b)   (i)   Describe three ways of using forward rates in yield curve trade.   (3 marks)

         (ii)   A leading business publication gives the following prices for STRIPS with a principal of Sh.100:

Bond	Maturity year	Price (Sh.)
A	1	95.92
B	2	92.01
C	3	87.00

         Required:
         The annual forward rate from year two to year three.   (5 marks)

(c)   The annual coupon for a bond is Sh.9. This is paid on a semi-annual basis. A bond is purchased on a coupon payment date for Sh.95.20 and sold exactly two years later for Sh.101.50. The rollover rates for the first three coupons are 9.00%, 9.50% and 10.00% respectively.

Required:
The holding period yield of the bond.   (4 marks)

     (Total: 20 marks)

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Present Value of 1 Received at the End of n Periods:

$$PVIF_{r,n} = 1/(1+r)^n = (1+r)^{-n}$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1	.9901	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9174	.9091	.8929	8772	.8696	.8621	.8475	.8333	.8065	.7813	7576	7353
2	.9803	.9612	.9426	.9246	.9070	.8900	8734	.8573	.8417	.8264	.7972	.7695	.7561	.7432	.7182	.6944	.6504	.6104	5739	.5407
3	.9706	.9423	.9151	.8890	.8638	.8396	.8163	.7938	.7722	.7513	.7118	.6750	6575	.6407	.6086	.5787	.5245	.4768	.4348	3975
4	.9610	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.7084	.6830	.6355	.5921	.5718	.5523	.5158	.4823	.4230	.3725	.3294	.2923
5	.9515	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6499	.6209	.5674	5194	.4972	.4761	.4371	.4019	.3411	.2910	.2495	.2149
6	.9420	.8880	.8375	.7903	.7462	.7050	.6663	.6302	.5963	.5645	.5066	.4556	.4323	.4104	.3704	.3349	.2751	.2274	1890	.1580
7	.9327	.8706	.8131	.7599	.7107	.6651	.6227	.5835	.5470	.5132	.4523	.3996	.3759	.3538	.3139	.2791	.2218	.1776	.1432	.1162
8	.9235	.8535	.7894	.7307	.6768	.6274	.5820	.5403	.5019	.4665	.4039	.3506	.3269	.3050	.2660	.2326	.1789	.1388	1085	.0854
9	.9143	.8368	.7664	.7026	.6446	.5919	.5439	.5002	.4604	.4241	.3606	3075	.2843	.2630	.2255	.1938	.1443	.1084	.0822	.0628
10	.9053	.8203	.7441	.6756	.6139	.5584	.5083	.4632	.4224	.3855	.3220	2697	.2472	.2267	.1911	.1615	.1164	.0847	.0623	0462
11	.8963	.8043	.7224	.6496	.5847	.5268	.4751	.4289	.3875	.3505	.2875	2366	.2149	.1954	1619	.1346	.0938	.0662	.0472	.0340
12	.8874	.7885	.7014	.6246	.5568	.4970	.4440	.3971	.3555	.3186	.2567	2076	.1869	1685	.1372	.1122	.0757	.0517	.0357	.0250
13	.8787	.7730	.6810	.6006	.5303	.4688	.4150	.3677	.3262	.2897	.2292	1821	.1625	.1452	.1163	.0935	.0610	.0404	.0271	.0184
14	.8700	.7579	.6611	.5775	.5051	.4423	.3878	.3405	.2992	.2633	.2046	.1597	.1413	.1252	.0985	.0779	0492	.0316	.0205	.0135
15	.8613	.7430	.6419	.5553	.4810	.4173	.3624	3152	.2745	.2394	.1827	1401	.1229	1079	.0835	.0649	.0397	.0247	0155	0099
16	.8528	7284	.6232	.5339	.4581	.3936	.3387	.2919	.2519	.2176	.1631	.1229	1069	.0930	.0708	.0541	.0320	.0193	0118	0073
17	.8444	.7142	.6050	.5134	.4363	.3714	.3166	.2703	.2311	.1978	.1456	.1078	.0929	.0802	.0600	.0451	.0258	.0150	.0089	0054
18	.8360	.7002	.5874	.4936	.4155	.3503	.2959	.2502	.2120	.1799	.1300	0946	.0808	.0691	.0508	.0376	.0208	.0118	.0068	.0039
19	8277	.6864	.5703	.4746	.3957	.3305	.2765	.2317	.1945	.1635	.1161	.0829	.0703	.0596	.0431	.0313	.0168	.0092	.0051	.0029
20	.8195	.6730	.5537	.4564	.3769	.3118	.2584	.2145	.1784	1486	1037	0728	.0611	.0514	.0365	.0261	.0135	.0072	.0039	0021
25	.7798	.6095	4776	.3751	.2953	.2330	.1842	.1460	.1160	.0923	.0588	0378	.0304	.0245	0160	.0105	.0046	.0021	.0010	0005
30	.7419	.5521	.4120	.3083	.2314	.1741	.1314	.0994	.0754	.0573	.0334	0196	.0151	.0116	.0070	.0042	.0016	.0006	.0002	.0001
40	.6717	.4529	3066	.2083	.1420	.0972	.0668	.0460	.0318	.0221	.0107	.0053	.0037	.0026	.0013	.0007	.0002	.0001		
50	.6080	.3715	.2281	.1407	.0872	.0543	.0339	.0213	.0134	.0085	.0035	.0014	.0009	.0006	.0003	.0001				
60	.5504	.3048	.1697	.0951	.0535	.0303	.0173	.0099	.0057	.0033	.0011	.0004	.0002	.0001						

*The factor is zero to four decimal places

Present Value of an Annuity of 1 Per Period for n Periods:

$$PVIF_{r,t} = \sum_{t=1}^{n} \frac{1}{(1+r)^t} = \frac{1-\frac{1}{(1+r)^n}}{r}$$

Number of payments	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.6901	1.6467	1.6257	1.6052	1.5656	1.5278	1.4568	1.3916	1.3315
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1065	1.9813	1.8684	1.7663
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.0373	2.9137	2.8550	2.7982	2.6901	2.5887	2.4043	2.2410	2.0957
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6048	3.4331	3.3522	3.2743	3.1272	2.9906	2.7454	2.5320	2.3452
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.1114	3.8887	3.7845	3.6847	3.4976	3.3255	3.0205	2.7594	2.5342
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.5638	4.2883	4.1604	4.0386	3.8115	3.6046	3.2423	2.9370	2.6775
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	4.9676	4.6389	4.4873	4.3436	4.0776	3.8372	3.4212	3.0758	2.7860
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.3282	4.9464	4.7716	4.6065	4.3030	4.0310	3.5655	3.1842	2.8681
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.6502	5.2161	5.0188	4.8332	4.4941	4.1925	3.6819	3.2689	2.9304
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	5.9377	5.4527	5.2337	5.0286	4.6560	4.3271	3.7757	3.3351	2.9776
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.1944	5.6603	5.4206	5.1971	4.7932	4.4392	3.8514	3.3868	3.0133
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.4235	5.8424	5.5831	5.3423	4.9095	4.5327	3.9124	3.4272	3.0404
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.6282	6.0021	5.7245	5.4675	5.0081	4.6106	3.9616	3.4587	3.0609
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	6.8109	6.1422	5.8474	5.5755	5.0916	4.6755	4.0013	3.4834	3.0764
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	6.9740	6.2651	5.9542	5.6685	5.1624	4.7296	4.0333	3.5026	3.0882
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.1196	6.3729	6.0472	5.7487	5.2223	4.7746	4.0591	3.5177	3.0971
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.2497	6.4674	6.1280	5.8178	5.2732	4.8122	4.0799	3.5294	3.1039
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.3658	6.5504	6.1982	5.8775	5.3162	4.8435	4.0967	3.5386	3.1090
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.4694	6.6231	6.2593	5.9288	5.3527	4.8696	4.1103	3.5458	3.1129
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	7.8431	6.8729	6.4641	6.0971	5.4669	4.9476	4.1474	3.5640	3.1220
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737	9.4269	8.0552	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1242
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574	9.7791	8.2438	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1250
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617	9.9148	8.3045	7.1327	6.6605	6.2463	5.5541	4.9995	4.1666	3.5714	3.1250
60	44.9550	34.7609	27.6756	22.6235	18.9293	16.1614	14.0392	12.3766	11.0480	9.9672	8.3240	7.1401	6.6651	6.2402	5.5553	4.9999	4.1667	3.5714	3.1250

NORMAL CURVE

AREAS
under the
STANDARD
NORMAL CURVE
from 0 to z

z	0	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.201	.2051	.2088	.2123	.2157	.2190	.2224
0.6	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2996	.3023	.3051	.3078	.3106	3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000

KASNEB

CIFA PART III SECTION 5

FIXED INCOME INVESTMENTS ANALYSIS

WEDNESDAY: 23 November 2016.   Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE

(a)   Describe the following mechanisms available for issuing fixed income securities in the primary financial markets:

     (i)   Underwritten offerings.   (1 mark)

     (ii)   Shelf registration.   (1 mark)

     (iii)   Auctions.   (1 mark)

     (iv)   Private placements.   (1 mark)

(b)   Anthony Omenda, an investment and financial analyst with Topcap Ltd. has been tasked by his senior manager to prepare a report on how structured note securities differ from traditional debt securities.

     In the context of the above statement, discuss how the following structured note securities differ from traditional debt securities:

     (i)   Equity index-linked notes.   (2 marks)

     (ii)   Commodity-linked bear bonds.   (2 marks)

(c)   A fixed income trader is analysing a dual currency bond (USD/CHF) as a possible addition to his bond portfolio. He believes that CHF (Swiss franc) will appreciate against the United States Dollar (USD) over the life of the bond.

     Required:
     (i)   Explain the meaning of the term "dual currency bond".   (1 mark)

     (ii)   Give one reason why a dual currency bond might trade at a premium compared to identical single currency bond.   (1 mark)

     (iii)   Discuss whether there is an impact on a dual currency bond's interest payments and principal payments if the CHF appreciates against the USD over the life of the bond.   (2 marks)

(d)   Nyati Limited is a high yield bond issuer with a credit rating of Ba2/BB. The company has presented the following extract of financial statements for the year ended 31 December 2015:

	Sh."million"		Sh."million"
Cash	10	Accounts payable	10
Accounts receivable	15	Short term debt	5
Inventories	55	Current portion of long term debt	3
Total current assets	80	Total current liabilities	18
Land	10	Long term bank loans	30
Property, plant and equipment (net book value)	85	Secured bonds	10
Goodwill	25	Unsecured bonds	20
Total non-current assets	120	Total long term debt	60
Total assets	200	Pension liabilities	22
		Total liabilities	100
		Paid in capital	10
		Retained earnings	90
		Total shareholders equity	100
		Total liabilities and equity	200

Additional information:
1. For the year ended 31 December 2015, Nyati Limited's earnings before interest, taxes, depreciation and amortisation (EBITDA) were Sh.45 million.
2. For firms in Nyati's industry, credit rating standards for an investment grade (Baa3/BBB) credit rating include a debt to EBITDA ratio of less than 1.8x and a debt to capital ratio (based on all sources of financing) of less than 40%.
3. During an investor briefing, Nyati Limited's management states that they believe that Nyati Limited, should be upgraded to investment grade, based on its debt to EBITDA ratio of 1.5x and its debt to capital ratio of 34%.

Required:
Using appropriate ratios, justify why the credit analyst would disagree with the management's assessment.   (5 marks)

(e) An 8-year, 5.75% semi-annual coupon corporate bond is priced at Sh.108.32. The bond's duration and reported convexity are 6.4 and 50.0 respectively. The bond's credit spread narrows by 75 basis points due to a credit rating upgrade.

Required:
Estimate the return impact with convexity adjustment.   (3 marks)
(Total: 20 marks)

QUESTION TWO
(a) Evaluate how each of the following theories of the term structure of interest rates could explain an upward slope of the yield curve:

(i) Pure expectations theory.   (2 marks)

(ii) Liquidity preference theory.   (2 marks)

(iii) Market segmentation theory.   (2 marks)

(b) The following table shows the current coupon yields-to-maturity and spot rates of interest for six treasury securities:

Term to maturity of the treasury securities (years)	Current coupon yield-to-maturity (%)	Spot rate of interest (%)
1	5.25	5.25
2	5.75	5.79
3	6.15	6.19
5	6.45	6.51
10	6.95	7.10
30	7.25	7.67

Assume all the securities pay interest annually.

Required:
(i) The two-year implied forward rate three years from now under the pure expectations theory.   (3 marks)

(ii) State the assumption underlying the calculation of the implied forward rate in (b)(i) above.   (1 mark)

(c) An investor has 1-year, 10% semi-annually paying coupon bond priced at Sh.1,025. Assume that the 6-month spot rate on a bond equivalent basis is 8%.

Required:
The 1-year theoretical spot rate on a bond equivalent basis.   (4 marks)

(d) Baraka Hospital has been forced to file for bankruptcy protection. The company managing the hospital has been allowed to reorganise under the name United Hospital (2016). The court has specified that a new indenture should be written to accompany a planned new bond issue. The issue would have ten years to maturity and shall carry a 10% coupon that would be paid annually. The new agreement would relieve the company of the obligation to make interest payments during the first five years of the bond issue. For the remaining five years, regular interest payment would resume. Finally, at maturity, the principal (Sh.1,000) plus the accrued interest for the first five years would be paid. However, no additional interest would be payable on the deferred interest. The bond yield to maturity is 10%.

Required:
Determine the value of the bond with deferred interest.   (3 marks)

(e)   An investor purchases a Sh.1,000, 4.50% semi-annual coupon bond with seven years to maturity priced to yield 6.50% for Sh.888.94.

Required:
The re-investment income that must be generated over the life of the bond for the investor to realise a yield of 6.50%.

(3 marks)
(Total: 20 marks)

QUESTION THREE

(a)   Explain three uses of a yield curve in relation to fixed income investments analysis.   (3 marks)

(b)   (i)   Discuss three assumptions of structural models used in corporate credit risk analysis.   (6 marks)

        (ii)   John Omwodho is a fixed income analyst at Fiduciary Bank Limited. He is analysing the term structure of credit spread for one of the bank's holdings, Patcom Limited. He obtains the following data on Patcom Limited's 5-year, 3% senior unsecured corporate bonds issued three years ago:

Payment date	Risk-free rate (%)	Credit spread (%)
30/9/2014	0.15	0.01
31/3/2015	0.22	0.02
30/9/2015	0.25	0.03
31/3/2016	0.27	0.04

The rates given above are continuously compounded annual rates, and the par value of the bonds is Sh.1,000.

Required:
The present value of the expected loss for the corporate bond.   (6 marks)

(c)   Samuel Busolo is an investment analyst with City Bank (E.A.) Ltd. He is currently evaluating two bonds, Bond X and Bond Y, with the following characteristics:

Bond X: The yield for a 3% coupon, 10-year annual-pay bond is 2.5% at Nairobi Securities Exchange (NSE). The same bond sells for Sh.104.376 per Sh.100 face value at the Uganda Securities Exchange (USE).

Bond Y: The yield for a 3% coupon, 10-year annual-pay bond is 3.2% at Nairobi Securities Exchange (NSE). The same bond sells for Sh.97.22 per Sh.100 face value at the Dar es salaam Stock Exchange (DSE).

Required:
Using arbitrage-free pricing approach, identify the bond that would include an arbitrage opportunity.   (5 marks)
(Total: 20 marks)

QUESTION FOUR

(a)   Assess five factors that could affect the credit spread of a corporate bond.   (10 marks)

(b)   Wilson Omuse is considering the purchase of either of the following two bonds, CIE bond or PTB bond described below:

	CIE Bond	PTB Bond
Market price	Sh. 101.75	Sh.101.75
Maturity date	1 June 2026	1 June 2026
Call date	Non-callable	1 June 2021
Annual Coupon	6.25%	7.35%
Interest payment	Semi-annual	Semi-annual
Effective duration	7.35	5.40
Yield-to-maturity	6.02%	7.10%
Credit rating	A	A

Wilson Omuse realises his purchase decision would depend primarily on effective duration and he believes that interest rates would decline by 50 basis points at all maturities over the next six months.

Required:

(i) The percentage price change forecasted by effective duration for both the CIE bond and PTB bond, assuming interest rates decline by 50 basis points over the next six months. (2 marks)

(ii) The six-month horizon return (in percentage) for each bond, if the actual price of CIE bond is Sh.105.55 and the actual price of PTB bond is Sh.104.15 at the end of six months. (Assume you purchased the bonds to settle on 1 June 2016). (4 marks)

(iii) Wilson Omuse is surprised by the fact that although interest rates fell by 50 basis points, the actual price change for the CIE bond was greater than the price change forecasted by effective duration, whereas the actual price change for the PTB bond was lower than the price change forecasted by effective duration.

Explain why the actual price change would be greater for the CIE bond and lower for the PTB bond.

(4 marks)

(Total: 20 marks)

QUESTION FIVE

(a) Propose three reasons why the term-to-maturity of a bond is important to bond investors. (3 marks)

(b) Discuss three bond features that could affect the interest rate risk of a bond. (6 marks)

(c) In the context of bond valuation, explain the term "relative analysis of a bond". (2 marks)

(d) Mita Opati is a fixed income trader and uses the following binomial tree to value a bond with embedded options. The bond has a 12% annual coupon with two years to maturity, though the bond is putable at Sh.105 at the end of year 1.
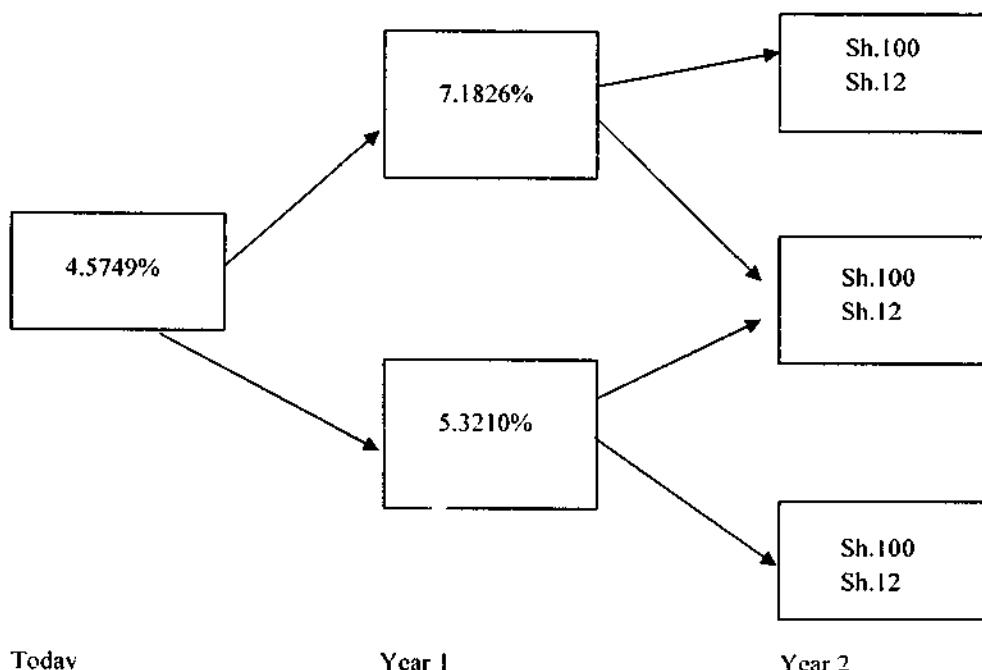
| Today | Year 1 | Year 2 |

Required:
The value of the embedded put option. (6 marks)

(e) A convertible bond with a 9% annual coupon is currently selling for Sh.1,073 with a conversion value of Sh.30 and a straight value of Sh.1,031. The ordinary shares pay a Sh.1.25 dividend per share and are currently selling for Sh.32 per share.

Required:
The premium payback period of the convertible bond. (3 marks)

(Total: 20 marks)

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Present Value of 1 Received at the End of n Periods:

$$PVIF_{r,n} = 1/(1+r)^n = (1+r)^{-n}$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1	.9901	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9174	.9091	.8929	.8772	.8696	.8621	.8475	.8333	.8065	.7813	.7576	.7353
2	.9803	.9612	.9426	.9246	.9070	.8900	.8734	.8573	.8417	.8264	.7972	.7695	.7561	.7432	.7182	.6944	.6504	.6104	.5739	.5407
3	.9706	.9423	.9151	.8890	.8638	.8396	.8163	.7938	.7722	.7513	.7118	.6750	.6575	.6407	.6086	.5787	.5245	.4768	.4348	.3975
4	.9610	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.7084	.6830	.6355	.5921	.5718	.5523	.5158	.4823	.4230	.3725	.3294	.2923
5	.9515	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6499	.6209	.5674	.5194	.4972	.4761	.4371	.4019	.3411	.2910	.2495	.2149
6	.9420	.8880	.8375	.7903	.7462	.7050	.6663	.6302	.5963	.5645	.5066	.4556	.4323	.4104	.3704	.3349	.2751	.2274	.1890	.1580
7	.9327	.8706	.8131	.7599	.7107	.6651	.6227	.5835	.5470	.5132	.4523	.3996	.3759	.3538	.3139	.2791	.2218	.1776	.1432	.1162
8	.9235	.8535	.7894	.7307	.6768	.6274	.5820	.5403	.5019	.4665	.4039	.3506	.3269	.3050	.2660	.2326	.1789	.1388	.1085	.0854
9	.9143	.8368	.7664	.7026	.6446	.5919	.5439	.5002	.4604	.4241	.3606	.3075	.2843	.2630	.2255	.1938	.1443	.1084	.0822	.0628
10	.9053	.8203	.7441	.6756	.6139	.5584	.5083	.4632	.4224	.3855	.3220	.2697	.2472	.2267	.1911	.1615	.1164	.0847	.0623	.0462
11	.8963	.8043	.7224	.6496	.5847	.5268	.4751	.4289	.3875	.3505	.2875	.2366	.2149	.1954	.1619	.1346	.0938	.0662	.0472	.0340
12	.8874	.7885	.7014	.6246	.5568	.4970	.4440	.3971	.3555	.3186	.2567	.2076	.1869	.1685	.1372	.1122	.0757	.0517	.0357	.0250
13	.8787	.7730	.6810	.6006	.5303	.4688	.4150	.3677	.3262	.2897	.2292	.1821	.1625	.1452	.1163	.0935	.0610	.0404	.0271	.0184
14	.8700	.7579	.6611	.5775	.5051	.4423	.3878	.3405	.2992	.2633	.2046	.1597	.1413	.1252	.0985	.0779	.0492	.0316	.0205	.0135
15	.8613	.7430	.6419	.5553	.4810	.4173	.3624	.3152	.2745	.2394	.1827	.1401	.1229	.1079	.0835	.0649	.0397	.0247	.0155	.0099
16	.8528	.7284	.6232	.5339	.4581	.3936	.3387	.2919	.2519	.2176	.1631	.1229	.1069	.0930	.0708	.0541	.0320	.0193	.0118	.0073
17	.8444	.7142	.6050	.5134	.4363	.3714	.3166	.2703	.2311	.1978	.1456	.1078	.0929	.0802	.0600	.0451	.0258	.0150	.0089	.0054
18	.8360	.7002	.5874	.4936	.4155	.3503	.2959	.2502	.2120	.1799	.1300	.0946	.0808	.0691	.0508	.0376	.0208	.0118	.0068	.0039
19	.8277	.6864	.5703	.4746	.3957	.3305	.2765	.2317	.1945	.1635	.1161	.0829	.0703	.0596	.0431	.0313	.0168	.0092	.0051	.0029
20	.8195	.6730	.5537	.4564	.3769	.3118	.2584	.2145	.1784	.1486	.1037	.0728	.0611	.0514	.0365	.0261	.0135	.0072	.0039	.0021
25	.7798	.6095	.4776	.3751	.2953	.2330	.1842	.1460	.1160	.0923	.0588	.0378	.0304	.0245	.0160	.0105	.0046	.0021	.0010	.0005
30	.7419	.5521	.4120	.3083	.2314	.1741	.1314	.0994	.0754	.0573	.0334	.0196	.0151	.0116	.0070	.0042	.0016	.0006	.0002	.0001
40	.6717	.4529	.3066	.2083	.1420	.0972	.0668	.0460	.0318	.0221	.0107	.0053	.0037	.0026	.0013	.0007	.0002	.0001		
50	.6080	.3715	.2281	.1407	.0872	.0543	.0339	.0213	.0134	.0085	.0035	.0014	.0009	.0006	.0003	.0001				
60	.5504	.3048	.1697	.0951	.0535	.0303	.0173	.0099	.0057	.0033	.0011	.0004	.0002	.0001						

* The factor is zero to four decimal places

Present Value of an Annuity of 1 Per Period for n Periods:

$$PVIF_{r,t} = \sum_{i=1}^{n} \frac{1}{(1+r)^i} = \frac{1 - \frac{1}{(1+r)^n}}{r}$$

Number of payments	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.6901	1.6467	1.6257	1.6052	1.5656	1.5278	1.4568	1.3916	1.3315
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1065	1.9813	1.8684	1.7663
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.0373	2.9137	2.8550	2.7982	2.6901	2.5887	2.4043	2.2410	2.0957
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6048	3.4331	3.3522	3.2743	3.1272	2.9906	2.7454	2.5320	2.3452
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.1114	3.8887	3.7845	3.6847	3.4976	3.3255	3.0205	2.7594	2.5342
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.5638	4.2883	4.1604	4.0386	3.8115	3.6046	3.2423	2.9370	2.6775
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	4.9676	4.6389	4.4873	4.3436	4.0776	3.8372	3.4212	3.0758	2.7860
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.3282	4.9464	4.7716	4.6065	4.3030	4.0310	3.5655	3.1842	2.8681
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.6502	5.2161	5.0188	4.8332	4.4941	4.1925	3.6819	3.2689	2.9304
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	5.9377	5.4527	5.2337	5.0286	4.6560	4.3271	3.7757	3.3351	2.9776
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.1944	5.6603	5.4206	5.1971	4.7932	4.4392	3.8514	3.3868	3.0133
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.4235	5.8424	5.5831	5.3423	4.9095	4.5327	3.9124	3.4272	3.0404
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.6282	6.0021	5.7245	5.4675	5.0081	4.6106	3.9616	3.4587	3.0609
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	6.8109	6.1422	5.8474	5.5755	5.0916	4.6755	4.0013	3.4834	3.0764
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	6.9740	6.2651	5.9542	5.6685	5.1624	4.7296	4.0333	3.5026	3.0882
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.1196	6.3729	6.0472	5.7487	5.2223	4.7746	4.0591	3.5177	3.0971
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.2497	6.4674	6.1280	5.8178	5.2732	4.8122	4.0799	3.5294	3.1039
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.3658	6.5504	6.1982	5.8775	5.3162	4.8435	4.0967	3.5386	3.1090
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.4694	6.6231	6.2593	5.9288	5.3527	4.8696	4.1103	3.5458	3.1129
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	7.8431	6.8729	6.4641	6.0971	5.4669	4.9476	4.1474	3.5640	3.1220
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737	9.4269	8.0552	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1242
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574	9.7791	8.2438	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1242
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617	9.9148	8.2438	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1250
60	44.9550	34.7609	27.6756	22.6235	18.9293	16.1614	14.0392	12.3766	11.0480	9.9672	8.3240	7.1401	6.6651	6.2402	5.5553	4.9999	4.1667	3.5714	3.1250

KASNEB

CIFA PART III SECTION 5

FIXED INCOME INVESTMENTS ANALYSIS

WEDNESDAY: 25 May 2016.   Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE
(a)   Assess three negative bond covenants that could be included in a bond indenture.   (3 marks)

(b)   Discuss the following coupon payment structures offered in the global fixed income markets:

    (i)   Floating rate notes (FRNs).   (2 marks)

    (ii)   Step-up coupon bonds.   (2 marks)

    (iii)   Credit-linked coupon bonds.   (2 marks)

    (iv)   Payment-in-kind (PIK) coupon bonds.   (2 marks)

    (v)   Deferred coupon bonds.   (2 marks)

(c)   Amos Maina has just purchased a bond with a par value of Sh.1,000 at a price of Sh.959.20 and an annual coupon payment rate of 5 per cent. The bond has 5 years to maturity.

    Required:
    (i)   The bond's current yield.   (2 marks)

    (ii)   The bond's adjusted current yield.   (2 marks)

    (iii)   The bond's yield-to-maturity (YTM).   (3 marks)
                                                    (Total: 20 marks)

QUESTION TWO
(a)   Commercial banks act as an important source of credit to both individual and corporate clients. For this reason, they are expected to maintain considerable levels of liquidity at all times to mitigate against bank runs in the financial systems.

    Required:
    With reference to the above statement, discuss the following short-term wholesale funding alternatives available to commercial banks:

    (i)   Reserve funds.   (2 marks)

    (ii)   Interbank funds.   (2 marks)

    (iii)   Large-denomination negotiable certificates of deposits.   (2 marks)

(b)   Explain three factors that could affect the level of a repurchase agreement (repo) margin.   (3 marks)

(c)   Evaluate three credit risk measures of a bond.   (3 marks)

(d)   Mboleza Limited has 8% convertible bond which is due for redemption in 5 years' time. The bond is currently quoted at a nominal value of Sh.82 per Sh.100. The bond can be converted into 25 ordinary shares in 5 years' time. The current market price per share of the company is Sh.3.50. This price is expected to grow at a constant rate of 5% per annum. The corporate tax rate is 30%.

Required:

(i) Determine whether the bondholders would consider converting the bond or redeeming the bond at the end of the fifth year. (3 marks)

(ii) Calculate the cost of the convertible bond. (5 marks)

(Total: 20 marks)

QUESTION THREE

(a) Highlight three assumptions of yield-to-maturity (YTM). (3 marks)

(b) Evaluate three differences between the money market and the bond market in relation to yield measures. (3 marks)

(c) The following information relates to a portfolio constructed from zero coupon issues of Sh.100 million:

Portfolio	2 year issue	16 year issue	30 year issue
I	Sh.50 million	-	Sh.50 million
II	-	Sh.100 million	-

Required:

(i) Key rate duration for each issue of the securities in the portfolio. (3 marks)

(ii) Effective duration for each portfolio. (2 marks)

(d) A one-year zero-coupon bond yields 6.0 per cent. The two-year and three-year zero coupon bonds yield 7.0 per cent and 8.0 per cent respectively.

Required:

(i) The forward rate for a one-year loan beginning in one year. (3 marks)

(ii) The forward rate for a two-year loan beginning in one year. (3 marks)

(iii) The forward rate for a one-year loan beginning in two years. (3 marks)

(Total: 20 marks)

QUESTION FOUR

(a) Evaluate four characteristics of credit scores used in credit analysis models. (8 marks)

(b) In January 2016, the government of your country issued a 10-year on-the-run treasury bond, and a 10-year infrastructure bond. The yield on the 10-year on-the-run treasury bond issue was 4.88%, while the yield on the 10% infrastructure bond was 6.24%.

Required:

(i) Absolute yield spread. (2 marks)

(ii) Relative yield spread. (2 marks)

(iii) Yield ratio. (2 marks)

(c) Waumini county government has issued 8%, Sh.1000 par value municipal bond with a maturity of 10 years. The spot rate of interest rates have been forecasted as follows:

Year	Spot rate (yield) %
1	9
2	10
3	11
4	8
5	10
6	11
7	9
8	12
9	8.5
10	10

Required:

The Arbitrage-free value of the bond. (6 marks)

(Total: 20 marks)

QUESTION FIVE

(a) (i) Equilibrium term structure models such as the Cox-Ingersoll-Ross Model and the Vasicek Model usually seek to describe the dynamics of the term structure using fundamental economic variables that are assumed to affect interest rates.

Required:
In relation to the above statement, discuss three characteristics shared by equilibrium term structure models.
(3 marks)

(ii) Summarise three strengths of the reduced form models used in corporate credit risk analysis. (3 marks)

(b) (i) Explain the term "price value of a basis point (PVBP)" as used in fixed income securities. (1 mark)

(ii) Mr. Hakiba is holding a Sh.1,000, 8%, 10 year bond which is currently selling at Sh.877.110. The current market yield is 10%. He anticipates that the interest rates would increase in the near future, a fact that would affect the market value of his bond. He has approached you as an investment and financial analyst to help him assess the price volatility of the bond in order to quantify the interest rate risk.

Required:
The price value of a basis point (PVBP). (6 marks)

(c) The following information was extracted from Dyton Ltd.'s consolidated income statement for the year ended 31 December 2015:

	Sh. "Million"
Gross profit	5,730
Royalty and commission income	100
Other operating income	110
Other operating expenses	(5,046)
Operating profit	894
Interest income	25
Interest expenses	(113)
Income before taxes	806
Income taxes	238
Net income	568

Additional information:
1. Depreciation and amortisation amounted to Sh.249 million.
2. Total assets are estimated to be Sh.10,618 million.
3. Total debt amounted to Sh.1,613 million.
4. Shareholders equity is Sh.4,616 million.

Required:
(i) Earnings before interest, tax, depreciation and amortisation (EBITDA) interest coverage ratio. (4 marks)

(ii) Debt/capital ratio. (3 marks)

(Total: 20 marks)

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Present Value of 1 Received at the End of *n* Periods:

$$PVIF_{r,n} = 1/(1+r)^n = (1+r)^{-n}$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1	.9901	.9804	.9709	.9615	.9524	.9434	.9346	9259	.9174	.9091	.8929	8772	.8696	.8621	.8475	.8333	.8065	7813	7576	7353
2	.9803	.9612	.9426	.9246	.9070	.8900	.8734	.8573	.8417	.8264	.7972	.7695	.7561	.7432	.7182	.6944	.6504	6104	5739	.5407
3	.9706	.9423	.9151	8890	.8638	.8396	.8163	.7938	7722	.7513	7118	6750	.6575	.6407	.6086	.5787	.5245	.4768	.4348	.3975
4	.9610	.9238	.8885	.8548	.8227	.7921	.7629	.7350	7084	.6830	.6355	.5921	.5718	.5523	.5158	.4823	.4230	.3725	3294	.2923
5	.9515	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6499	.6209	.5674	5194	.4972	.4761	.4371	.4019	.3411	.2910	2495	.2149
6	.9420	.8880	.8375	.7903	.7462	.7050	.6663	.6302	.5963	.5645	.5066	.4556	.4323	.4104	.3704	.3349	.2751	.2274	1890	.1580
7	.9327	.8706	.8131	.7599	.7107	.6651	.6227	.5835	.5470	.5132	.4523	.3996	.3759	.3538	.3139	.2791	.2218	:1776	.1432	.1162
8	.9235	.8535	.7894	.7307	.6768	.6274	.5820	.5403	.5019	.4665	.4039	.3506	.3269	.3050	.2660	.2326	.1789	.1388	.1085	.0854
9	.9143	.8368	.7664	.7026	.6446	.5919	.5439	.5002	.4604	.4241	.3606	.3075	.2843	.2630	.2255	.1938	.1443	.1084	.0922	.0628
10	.9053	.8203	.7441	.6756	.6139	.5584	.5083	.4632	.4224	.3855	.3220	.2697	.2472	.2267	.1911	.1615	.1164	.0847	.0623	.0462
11	.8963	.8043	.7224	.6496	.5847	.5268	.4751	.4289	.3875	.3505	.2875	.2366	.2149	.1954	.1619	.1346	.0938	.0662	.0472	.0340
12	.8874	.7885	.7014	.6246	.5568	.4970	.4440	.3971	.3555	.3186	.2567	.2076	.1869	1685	.1372	.1122	.0757	.0517	.0357	.0250
13	.8787	.7730	.6810	.6006	.5303	.4688	.4150	.3677	.3262	.2897	.2292	.1821	.1625	.1452	.1163	.0935	.0610	.0404	.0271	.0184
14	.8700	.7579	.6611	.5775	.5051	.4423	.3878	.3405	.2992	.2633	.2046	.1597	.1413	.1252	.0985	.0779	.0492	.0316	.0205	.0135
15	.8613	.7430	.6419	.5553	.4810	.4173	.3624	3152	.2745	.2394	.1827	.1401	.1229	.1079	.0835	.0649	.0397	.0247	.0155	0099
16	.8528	.7284	.6232	.5339	.4581	.3936	.3387	.2919	.2519	.2176	.1631	.1229	1069	.0930	.0708	.0541	.0320	.0193	.0118	.0073
17	.8444	.7142	.6050	.5134	.4363	.3714	.3166	.2703	.2311	.1978	.1456	.1078	.0929	.0802	.0600	.0451	.0258	.0150	.0089	.0054
18	.8360	.7002	.5874	.4936	.4155	.3503	.2959	.2502	.2120	.1799	.1300	.0946	.0808	.0691	.0508	.0376	.0208	.0118	.0068	.0039
19	.8277	.6864	.5703	.4746	.3957	.3305	.2765	2317	.1945	.1635	.1161	.0829	.0703	.0596	.0431	.0313	.0168	.0092	.0051	.0029
20	.8195	.6730	.5537	.4564	.3769	.3118	.2584	.2145	.1784	.1486	1037	0728	.0611	.0514	.0365	.0261	.0135	.0072	.0039	.0021
25	.7798	.6095	.4776	.3751	.2953	.2330	.1842	.1460	.1160	.0923	.0588	.0378	.0304	.0245	.0160	.0105	.0046	.0021	.0010	0005
30	.7419	.5521	.4120	.3083	.2314	.1741	.1314	.0994	.0754	.0573	.0334	.0196	.0151	.0116	.0070	.0042	.0016	.0006	0002	.0001
40	.6717	.4529	3066	.2083	.1420	.0972	.0668	.0460	.0318	.0221	.0107	.0053	.0037	.0026	.0013	.0007	.0002	.0001		
50	.6080	.3715	.2281	.1407	.0872	.0543	.0339	.0213	.0134	.0085	.0035	.0014	.0009	.0006	.0003	.0001				
60	.5504	.3048	.1697	.0951	.0535	.0303	.0173	.0099	.0057	.0033	.0011	.0004	.0002	.0001						

* The factor is zero to four decimal places

Present Value of an Annuity of 1 Per Period for n Periods:

$$PVIF_{r,t} = \sum_{t=1}^{n} \frac{1}{(1+r)^t} = \frac{1 - \dfrac{1}{(1+r)^n}}{r}$$

number of payments	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.6901	1.6467	1.6257	1.6052	1.5656	1.5278	1.4568	1.3916	1.3315
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1065	1.9813	1.8684	1.7663
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.0373	2.9137	2.8550	2.7982	2.6901	2.5887	2.4043	2.2410	2.0957
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6048	3.4331	3.3522	3.2743	3.1272	2.9906	2.7454	2.5320	2.3452
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.1114	3.8887	3.7845	3.6847	3.4976	3.3255	3.0205	2.7594	2.5342
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.5638	4.2883	4.1604	4.0386	3.8115	3.6046	3.2423	2.9370	2.6775
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	4.9676	4.6389	4.4873	4.3436	4.0776	3.8372	3.4212	3.0758	2.7860
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.3282	4.9464	4.7716	4.6065	4.3030	4.0310	3.5655	3.1842	2.8681
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.6502	5.2161	5.0188	4.8332	4.4941	4.1925	3.6819	3.2689	2.9304
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	5.9377	5.4527	5.2337	5.0286	4.6560	4.3271	3.7757	3.3351	2.9776
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.1944	5.6603	5.4206	5.1971	4.7932	4.4392	3.8514	3.3868	3.0133
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.4235	5.8424	5.5831	5.3423	4.9095	4.5327	3.9124	3.4272	3.0404
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.6282	6.0021	5.7245	5.4675	5.0081	4.6106	3.9616	3.4587	3.0609
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	6.8109	6.1422	5.8474	5.5755	5.0916	4.6755	4.0013	3.4834	3.0764
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	6.9740	6.2651	5.9542	5.6685	5.1624	4.7296	4.0333	3.5026	3.0882
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.1196	6.3729	6.0472	5.7487	5.2223	4.7746	4.0591	3.5177	3.0971
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.2497	6.4674	6.1280	5.8178	5.2732	4.8122	4.0799	3.5294	3.1039
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.3658	6.5504	6.1982	5.8775	5.3162	4.8435	4.0967	3.5386	3.1090
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.4694	6.6231	6.2593	5.9288	5.3527	4.8696	4.1103	3.5458	3.1129
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	7.8431	6.8729	6.4641	6.0971	5.4669	4.9476	4.1474	3.5640	3.1220
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737	9.4269	8.0552	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1242
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574	9.7791	8.2438	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1250
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617	9.9148	8.3045	7.1327	6.6605	6.2463	5.5541	4.9995	4.1666	3.5714	3.1250
60	44.9550	34.7609	27.6756	22.6235	18.9293	16.1614	14.0392	12.3766	11.0480	9.9672	8.3240	7.1401	6.6651	6.2402	5.5553	4.9999	4.1667	3.5714	3.1250

KASNEB

CIFA PART III SECTION 5

FIXED INCOME INVESTMENTS ANALYSIS

WEDNESDAY: 25 November 2015.   Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE

(a)   In relation to credit analysis models:

      (i)   Summarise three weaknesses of structural models of analysing corporate credit risk.   (3 marks)

      (ii)   Outline four assumptions of reduced form models of corporate credit risk analysis.   (4 marks)

(b)   The following data relate to valuation of a 1-year, 5% Jogoo Ltd. senior unsecured bonds:

Time to cash flow	Cash flow (Sh.)	Risk-free spot rate (%)	Credit spread (%)
0.5	25	0.23	0.8
1	1,025	0.25	0.85

Required:
The present value of the expected loss for Jogoo Ltd.'s bond.   (6 marks)

(c)   An investor is considering the purchase of an option free bond which has an annual coupon rate of 7.25% with 15 years remaining to maturity. The price of the bond is Sh.106.1301 and the yield-to-maturity (YTM) is 6.6%. The treasury yield curve is flat at 6%. and the credit spread for this issuer is 60 basis points. The reinvestment rate is 4%. At the horizon date. the treasury yield curve is flat at 5.65% and the credit spread for this issuer is 50 basis points for all maturities.

Required:
The total return on a bond equivalent basis.   (7 marks)
(Total: 20 marks)

QUESTION TWO

(a)   Describe five embedded options associated with fixed income securities.   (5 marks)

(b)   Explain three risks that investors participating in global debt markets might face by relying on credit rating agencies.   (3 marks)

(c)   The following information relates to industrial comparative ratio analysis of three companies for the year ended 30 December 2014.

Company	EBITDA margin (%)	Return on capital (%)	EBIT/Interest expense (x)	EBITDA/Interest expense (x)	Debt/EBITDA (x)	Debt/Capital (%)
Adept Ltd.	26.2	26.1	17.0	20.7	2.7	36.3
Bell Ltd.	30.7	37.4	59.3	63.5	1.6	17.0
Capa Ltd.	22.7	16.7	10.0	13.5	3.6	47.4

Where: EBITDA -Earnings before interest, tax, depreciation and amortisation.
     x – Number of times.

Required:
(i)   Determine the company with the highest credit risk, based on leverage ratios only.   (3 marks)

(ii)   Determine the company with the highest credit quality, based on coverage ratios only.   (3 marks)

(d)   Samuel Mwirigi is an investment analyst in charge of fixed income analysis in an investment and finance consulting firm. He has recently been tasked by his immediate supervisor to prepare an analysis of a convertible bond issued by Adrosoft Ltd. for presentation to the investment committee. From both the market information and Adrosoft Ltd.'s prospectus, Mwirigi has gathered the following data:

Issuer: Adrosoft Ltd.
Issue date: 16 November 2011
Maturity date: 16 November 2016
Interest: 3.76% payable annually
Issue size: Sh.10 million
Issue price: Sh.900
Conversion ratio: 24.27
Convertible bond price on 16 November 2013: Sh.1,440
Share price on 16 November 2013: Sh.58

Required:

(i)   The conversion price.   (2 marks)

(ii)   The conversion value on 16 November 2013.   (2 marks)

(iii)   The market conversion premium per share on 16 November 2013.   (2 marks)
                                                                              (Total: 20 marks)

QUESTION THREE

(a)   Highlight four instances that could make yield-to-maturity (YTM) to provide a poor estimate of expected return of a bond.   (4 marks)

(b)   Discuss five risks associated with investing in fixed income securities.   (5 marks)

(c)   Explain three factors affecting the shape of the yield curve.   (6 marks)

(d)   An investor has purchased a floating rate security with a 5-year maturity. The coupon formula for the floater is 6-month LIBOR plus 200 basis points and the interest payments are made semi-annually. The floater is not callable. At the time of purchase, the 6-month LIBOR is 7.5%. The investor borrowed the funds to purchase the floater by issuing a 5-year note at par value, with a fixed coupon rate of 7%. An investor can enter into a 5-year interest rate swap in which the investor pays LIBOR, that is, the investor is the fixed rate receiver. The swap rate is 7.3% and the frequency of the payments is semi-annual.

Required:
The annual income spread that the investor could lock in.   (5 marks)
                                                                              (Total: 20 marks)

QUESTION FOUR

(a)   Evaluate two methods that could be used to estimate interest rate volatility.   (4 marks)

(b)   Discuss the following spread measures:

(i)   Option adjusted spread (OAS).   (2 marks)

(ii)   Z-spread.   (2 marks)

(c)   A bond is purchased between coupon periods. The days between the settlement date and the next coupon period is 60 days. There are 182 days in the coupon period.

The bond has a face value of Sh.100 and a coupon rate of 12%. There are eight semi-annual coupon payments remaining.

The discount rate is 10%.

Required:

(i)   The bond's dirty price.

(ii)   The bond's accrued interest.   (1 mark)

(d)   A treasury bond with a face value of Sh.100, a coupon rate of 8.0%, a yield-to-maturity (YTM) of 8.0% and a term to maturity of 5 years pays interest semi-annually.

A fixed income analyst intends to determine the total percentage change in price due to duration and convexity for a change in yield of a 100 basis point. The analyst has estimated the convexity for the security as 20.1886.

Required:
The total percentage change in price when yield changes from 8.0% to 7.0%.   (7 marks)

(Total: 20 marks)

QUESTION FIVE

(a)   Analyse five criteria of classifying global fixed-income markets.   (10 marks)

(b)   The following data relate to forward rates:

Period	Annual forward rate (%)
1	5.00
2	5.40
3	6.00
4	6.60
5	7.00
6	7.40

A bond has a term-to-maturity of three years, 8% coupon rate, and a par value of Sh.100.

Required:
The value of the bond.   (6 marks)

(c)   A fixed income analyst has estimated the key-rate durations for several maturities in three of her Sh.25 million bond duration shown below:

	Key rate durations for three fixed income portfolios		
Key rate duration	Portfolio 1	Portfolio 2	Portfolio 3
2-year	2.45	0.35	1.26
5-year	0.20	0.40	1.27
10-year	0.15	4.00	1.23
20-year	2.20	0.25	1.24
Total	5.00	5.00	5.00

The 5-year and 10-year key rates duration increased by 200 basis points but the 2-year and 20-year key rates durations remain unchanged.

Required:
The portfolio that would experience the best price performance.   (4 marks)

(Total: 20 marks)

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Present Value of 1 Received at the End of n Periods:

$$PVIF_{r,n} = 1/(1+r)^n = (1+r)^{-n}$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1	.9901	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9174	.9091	.8929	.8772	.8696	.8621	.8475	.8333	.8065	.7813	.7576	.7353
2	.9803	.9612	.9426	.9246	.9070	.8900	.8734	.8573	.8417	.8264	.7972	.7695	.7561	.7432	.7182	.6944	.6504	.6104	.5739	.5407
3	.9706	.9423	.9151	.8890	.8638	.8396	.8163	.7938	.7722	.7513	.7118	.6750	.6575	.6407	.6086	.5787	.5245	.4768	.4348	.3975
4	.9610	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.7084	.6830	.6355	.5921	.5718	.5523	.5158	.4823	.4230	.3725	.3294	.2923
5	.9515	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6499	.6209	.5674	.5194	.4972	.4761	.4371	.4019	.3411	.2910	.2495	.2149
6	.9420	.8880	.8375	.7903	.7462	.7050	.6663	.6302	.5963	.5645	.5066	.4556	.4323	.4104	.3704	.3349	.2751	.2274	.1890	.1580
7	.9327	.8706	.8131	.7599	.7107	.6651	.6227	.5835	.5470	.5132	.4523	.3996	.3759	.3538	.3139	.2791	.2218	.1776	.1432	.1162
8	.9235	.8535	.7894	.7307	.6768	.6274	.5820	.5403	.5019	.4665	.4039	.3506	.3269	.3050	.2660	.2326	.1789	.1388	.1085	.0854
9	.9143	.8368	.7664	.7026	.6446	.5919	.5439	.5002	.4604	.4241	.3606	.3075	.2843	.2630	.2255	.1938	.1443	.1084	.0822	.0628
10	.9053	.8203	.7441	.6756	.6139	.5584	.5083	.4632	.4224	.3855	.3220	.2697	.2472	.2267	.1911	.1615	.1164	.0847	.0623	.0462
11	.8963	.8043	.7224	.6496	.5847	.5268	.4751	.4289	.3875	.3505	.2875	.2366	.2149	.1954	.1619	.1346	.0938	.0662	.0472	.0340
12	.8874	.7885	.7014	.6246	.5568	.4970	.4440	.3971	.3555	.3186	.2567	.2076	.1869	.1685	.1372	.1122	.0757	.0517	.0357	.0250
13	.8787	.7730	.6810	.6006	.5303	.4688	.4150	.3677	.3262	.2897	.2292	.1821	.1625	.1452	.1163	.0935	.0610	.0404	.0271	.0184
14	.8700	.7579	.6611	.5775	.5051	.4423	.3878	.3405	.2992	.2633	.2046	.1597	.1413	.1252	.0985	.0779	.0492	.0316	.0205	.0135
15	.8613	.7430	.6419	.5553	.4810	.4173	.3624	.3152	.2745	.2394	.1827	.1401	.1229	.1079	.0835	.0649	.0397	.0247	.0155	.0099
16	.8528	.7284	.6232	.5339	.4581	.3936	.3387	.2919	.2519	.2176	.1631	.1229	.1069	.0930	.0708	.0541	.0320	.0193	.0118	.0073
17	.8444	.7142	.6050	.5134	.4363	.3714	.3166	.2703	.2311	.1978	.1456	.1078	.0929	.0802	.0600	.0451	.0258	.0150	.0089	.0054
18	.8360	.7002	.5874	.4936	.4155	.3503	.2959	.2502	.2120	.1799	.1300	.0946	.0808	.0691	.0508	.0376	.0208	.0118	.0068	.0039
19	.8277	.6864	.5703	.4746	.3957	.3305	.2765	.2317	.1945	.1635	.1161	.0829	.0703	.0596	.0431	.0313	.0168	.0092	.0051	.0029
20	.8195	.6730	.5537	.4564	.3769	.3118	.2584	.2145	.1784	.1486	.1037	.0728	.0611	.0514	.0365	.0261	.0135	.0072	.0039	.0021
25	.7798	.6095	.4776	.3751	.2953	.2330	.1842	.1460	.1160	.0923	.0588	.0378	.0304	.0245	.0160	.0105	.0046	.0021	.0010	.0005
30	.7419	.5521	.4120	.3083	.2314	.1741	.1314	.0994	.0754	.0573	.0334	.0196	.0151	.0116	.0070	.0042	.0016	.0006	.0002	.0001
40	.6717	.4529	.3066	.2083	.1420	.0972	.0668	.0460	.0318	.0221	.0107	.0053	.0037	.0026	.0013	.0007	.0002	.0001		
50	.6080	.3715	.2281	.1407	.0872	.0543	.0339	.0213	.0134	.0085	.0035	.0014	.0009	.0006	.0003	.0001				
60	.5504	.3048	.1697	.0951	.0535	.0303	.0173	.0099	.0057	.0033	.0011	.0004	.0002	.0001						

* The factor is zero to four decimal places

Present Value of an Annuity of 1 Per Period for n Periods:

$$PVIF_{r,n} = \sum_{t=1}^{n} \frac{1}{(1+r)^t} = \frac{1- \frac{1}{(1+r)^n}}{r}$$

Number of payments	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.6901	1.6467	1.6257	1.6052	1.5656	1.5278	1.4568	1.3916	1.3315
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1065	1.9813	1.8684	1.7663
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.0373	2.9137	2.8550	2.7982	2.6901	2.5887	2.4043	2.2410	2.0957
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6048	3.4331	3.3522	3.2743	3.1272	2.9906	2.7454	2.5320	2.3452
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.1114	3.8887	3.7845	3.6847	3.4976	3.3255	3.0205	2.7594	2.5342
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.5638	4.2883	4.1604	4.0386	3.8115	3.6046	3.2423	2.9370	2.6775
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	4.9676	4.6389	4.4873	4.3436	4.0776	3.8372	3.4212	3.0758	2.7860
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.3282	4.9464	4.7716	4.6065	4.3030	4.0310	3.5655	3.1842	2.8681
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.6502	5.2161	5.0188	4.8332	4.4941	4.1925	3.6819	3.2689	2.9304
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	5.9377	5.4527	5.2337	5.0286	4.6560	4.3271	3.7757	3.3351	2.9776
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.1944	5.6603	5.4206	5.1971	4.7932	4.4392	3.8514	3.3868	3.0133
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.4235	5.8424	5.5831	5.3423	4.9095	4.5327	3.9124	3.4272	3.0404
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.6282	6.0021	5.7245	5.4675	5.0081	4.6106	3.9616	3.4587	3.0609
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	6.8109	6.1422	5.8474	5.5755	5.0916	4.6755	4.0013	3.4834	3.0764
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	6.9740	6.2651	5.9542	5.6685	5.1624	4.7296	4.0333	3.5026	3.0882
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.1196	6.3729	6.0472	5.7487	5.2223	4.7746	4.0591	3.5177	3.0971
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.2497	6.4674	6.1280	5.8178	5.2732	4.8122	4.0799	3.5294	3.1039
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.3658	6.5504	6.1982	5.8775	5.3162	4.8435	4.0967	3.5386	3.1090
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.4694	6.6231	6.2593	5.9288	5.3527	4.8696	4.1103	3.5458	3.1129
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	7.8431	6.8729	6.4641	6.0971	5.4669	4.9476	4.1474	3.5640	3.1220
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737	9.4269	8.0552	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1242
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574	9.7791	8.2438	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1250
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617	9.9148	8.3045	7.1327	6.6605	6.2463	5.5541	4.9995	4.1666	3.5714	3.1250
60	44.9550	34.7609	27.6756	22.6235	18.9293	16.1614	14.0392	12.3766	11.0480	9.9672	8.3240	7.1401	6.6651	6.2402	5.5553	4.9999	4.1667	3.5714	3.1250

KASNEB

CIFA PART III SECTION 5

FIXED INCOME INVESTMENT ANALYSIS

PILOT PAPER

September 2015.   Time Allowed: 3 hours.

**Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.**

QUESTION ONE

(a)   Bond securities are usually quoted in price, yield or spread over an underlying benchmark bond.

Required:
Briefly explain the following terms as used in bond pricing.

    (i)   Bond quoted price.   (2 marks)

    (ii)   Bond quoted yield.   (2 marks)

    (iii)   Bond quoted spread.   (2 marks)

    (iv)   Underlying benchmark bond.   (2 marks)

(b)   Wealth Maximisers, a fund management firm has not previously included Consumer Price Index (CPI) linked government bonds in its bond fund portfolio. However, as a bond analyst, you wish to recommend that such bonds should be included because prices on the CPI-linked government bonds experienced a much greater decline during last year's financial market upheavals than prices for ordinary government bonds.

Required:
Briefly explain three reasons why CPI-linked government bonds are beneficial to both investors and the government.

(6 marks)

(c)   Harun Mong'are, aged 32 years has Sh.4,000,000 to invest in fixed-income securities. He has invested in various types of bonds for 10 years and considers himself to be an aggressive investor. He is in the 28% marginal income tax bracket. His primary goal is capital appreciation, income is a secondary consideration.

Harun Mong'are's financial planner has presented the following securities and their after tax yields:
1.   15-year BB rated, non-callable corporate bonds trading near par with a yield of 11.8%.
2.   20-year, A rated, discount, public purpose callable general obligation country bond with a taxable equivalent yield of 12.2%.
3.   10-year, A rated, premium, callable, sinking fund corporate bonds with a yield of 9.5%.
4.   Treasury bill with a yield of 8.0%.

Required:
Evaluate each of the above securities and recommend which security would be appropriate for Harun Mong'are.

(6 marks)
(Total: 20 marks)

QUESTION TWO

A bond dealer on the Paa Securities Exchange (PSE) has provided the following information on a portfolio of fixed income-securities:

Par value (Sh.)	Market price (Sh.)	Coupon (%)	Modified duration	Effective duration	Effective convexity
2 million	100	6.5	8	8	154
3 million	93	5.5	6	1	50
1 million	95	7.0	8.5	8.5	130
4 million	103	8.0	9	5	-70

Required:

(i)   The effective duration for the portfolio.   (4 marks)

(ii)   The price value of a basis point for the portfolio.   (3 marks)

(iii)   The bond(s) that are likely to have no embedded options.   (2 marks)

(iv)   The bond(s) that are likely to be callable.   (2 marks)

(v)   The bond(s) that are likely to be putable.   (2 marks)

(vi)   The approximate price change for the 7% bond if its yield to maturity increases by 25 basis points.   (3 marks)

(vii)   Outline why two bond dealers might differ in their estimates of a portfolio's effective duration.   (2 marks)

(viii) Explain why the portfolio's effective duration might be an inadequate measure of interest rate risk for a bond portfolio even if we assume the bond effective durations are correct.   (2 marks)

(Total: 20 marks)

QUESTION THREE

(a)   Assume that you are a senior credit analyst in a credit rating agency. You have been appointed by your organisation to make a presentation to the Kenya Bankers Association members on the roles played by credit rating agencies in credit risk management.

Required:

(i)   Explain the credit related risks affecting corporate bonds.   (4 marks)

(ii)   Describe the ranking of corporate debt in terms of seniority and explain the potential violation of the priority of claims in bankruptcy proceedings.   (4 marks)

(iii)   Distinguish between corporate issuer credit rating and issue credit rating and describe the rating agency practice agencies.   (4 marks)

(iv)   Explain the inherent risks from relying on ratings from credit rating agencies.   (4 marks)

(b)   The following data relates to two high yield firms in the same industry:

Sh. (million)

	A	B
Cash	200.00	100.00
Interest expense	80.00	40.00
EBITDA	170.00	85.00
Secured bank debt	1,000.00	250.00
Senior unsecured debt	400.00	100.00
Convertible bonds	100.00	400.00

Required:

(i)   Calculate the total leverage through each level of debt for both firms.   (1 mark)

(ii)   Calculate the net leverage for both firms.   (1 mark)

(iii)   Comment on the firm that is more attractive to an unsecured debt investor.   (2 marks)

(Total: 20 marks)

QUESTION FOUR

(a)   You are the manager of a portfolio consisting of three bonds in equal par amounts of Sh.1,000,000 each. The first table shows the market value of the bonds and their durations (the price includes accrued interest). The second table contains the market value of the bonds and their durations one year later.

		Initial values		
Security	Price (Sh.)	Market value (Sh.)	Duration	Shilling duration
Bond No.1	106.110	1,060.531	5.909	?
Bond No.2	98.200	981,686	3.691	?
Bond No.3	109.140	1,090,797	5.843	?
	Portfolio shilling duration =			?

		After 1 year		
Security	Price (Sh.)	Market value (Sh.)	Duration	Shilling duration
Bond No.1	104.240	1,042,043	5.177	?
Bond No.2	98.084	980,461	2.817	?
Bond No.3	106.931	1,068,319	5.125	?
	Portfolio shilling duration =			?

As a manager, you wish to maintain the portfolio shilling duration at the initial level by rebalancing the portfolio. You choose to rebalance using the existing security proportions of one third each.

Required:

(i) Shilling duration of each of the bonds. (10 marks)

(ii) The rebalancing ration necessary for the rebalancing. (5 marks)

(iii) Cash required for the rebalancing. (5 marks)

(Total: 20 marks)

QUESTION FIVE

(a) (i) Explain the dominant type of structure in the investment-grade credit market. (2 marks)

(ii) Suggest three strategic portfolio implications of the dominant structure in (a) (i) above. (6 marks)

(iii) Explain the dominant structure in the high yield corporate bond market and why it is usually not the same structure as discussed in (a) (i) above. (2 marks)

(b) The managers of Reliable Life Insurance Ltd. are considering hiring a consultant to advice them on portfolio immunisation. The following are some of the statements that were made during the interview presentations:

1. A great thing about immunisation is that it is a set and forget strategy. That is, once you have immunised your portfolio, there is no subsequent work to be done.
2. The immunisation target rate of return is less than yield to maturity.
3. If a portfolio is immunised against a change in the market yield at a given horizon by matching portfolio duration to horizon, the portfolio faces no risk except for default risk.
4. The liquidity of securities used to construct an immunised portfolio is irrelevant.
5. In general, the entire portfolio does not have to be turned over to rebalance an immunised portfolio. Further, rebalancing need not be done on a daily basis.

Required:

(i) Argue the case against each of the above statements. (5 marks)

(ii) Comment on the validity of each of the above statements. (5 marks)

(Total: 20 marks)

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VALUATION AND ANALYSIS OF FIXED INCOME INSTRUMENTS

WEDNESDAY: 27 May 2015.

Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE

(a) Discuss four applications of repurchase agreements (REPOs). (8 marks)

(b) Outline four weaknesses of the Vasicek Model in relation to interest rate modelling. (4 marks)

(c) A Sh.1,000 par value bond with a 20 year maturity period and a 10% coupon rate payable annually, currently sells at 9% yield to maturity.

An investor with a 2 year horizon needs to forecast the total return on the bond over the coming 2 years. In 2 years time, the bond will have 18 years to maturity. The investor forecasts that 2 years from now, 18-year bonds will sell at a yield-to-maturity of 8% and that coupon payments could be reinvested in short-term securities over the coming 2 years at the rate of 7% per annum.

Required:
The annualised rate of return for the two-year bond. (8 marks)
(Total: 20 marks)

QUESTION TWO

(a) Discuss the three theories of the term structure of interest rates. (6 marks)

(b) A bond was purchased for Sh.840 one year ago. It has a coupon rate of 4%. It was sold for Sh.894. The inflation rate is 5%.

Required:
The real rate of return for the bond. (5 marks)

(c) Three bonds A, B and C trade in your country's bond market and pay annual coupons as illustrated in the following table:

Bond	Coupon	Maturity (years)	Price (%)
A	5%	1	100.96
B	6.5%	3	106.29
C	2.0%	3	93.84

Required:
The annualised forward rate from year two to year three. (9 marks)
(Total: 20 marks)

QUESTION THREE

(a) (i) Explain three advantages that might accrue to a company that uses convertible securities to finance its operations. (3 marks)

(ii) XYZ Ltd. is considering to issue Sh.10 million, 10% convertible subordinated debentures. The ordinary share price is currently valued at Sh.36 per share and the company believes it could obtain a conversion premium of 12%. The call price of the debenture in the first 10 years is Sh.1,060 per bond, after which it drops to Sh.1,030 in the next 10 years and Sh.1,000 in the last 10 years. To allow for fluctuations in the market price of the share, the company does not want to call the debentures until their conversion value is at least 15% in excess of the call price. Earnings per share (EPS) are expected to grow at an 8% compound annual rate in the foreseeable future and the company envisions no change in its price/earnings (P/E) ratio.

Required:
The expected length of time that must elapse before the company is in a position to force conversion. (6 marks)

(b) Using well labelled diagrams, illustrate the following non-parallel yield curve shifts:

(i) Yield curve twists. (3 marks)

(ii) Yield curve butterfly shifts. (3 marks)

(c) Samuel Omanyara observed a 1-year (zero-coupon) treasury security trading at a yield-to-maturity of 5% (price of 95.2381% of par). He also observed a 2-year treasury note with a 6% coupon, trading at a yield-to-maturity of 5.5%

(price of Sh.100.9232). And, finally, he observed a 3-year treasury note with a 7% coupon trading at a yield-to-maturity of 6% (price of Sh.102.6730). The par value of the zero-coupon bond is Sh.100.

Assume annual coupon payments.

Required:
The 2-year and 3-year spot rates using the bootstrapping method. (5 marks)
(Total: 20 marks)

QUESTION FOUR

(a) Examine five ways in which innovations in the bond market instruments could add value to both the issuers and investors in the bond market sector. (10 marks)

(b) The portfolio manager of Stanbank Ltd.'s defined benefit pension scheme is considering to invest in two bonds which are about to be issued by Kings Life Insurance Company. The first bond is a 30-year, 4% semiannual coupon payment while the second one is a 100-year, 4% semiannual coupon payment "century" bond. Both bonds are expected to trade at par value at issuance.

Required:
The approximate modified duration and modified convexity for each bond using a 5 basis point increase and decrease in the annual yield-to-maturity. (10 marks)
(Total: 20 marks)

QUESTION FIVE

(a) Evaluate three risks associated with relying on credit rating agencies such as Standard and Poor (S & P). (6 marks)

(b) Identify four Malkiel's bond pricing relationships. (4 marks)

(c) A treasury bond pays 9% coupon annually. On 12 June 2014, the bond had 63 days to the next coupon payment and there were 297 days since the previous coupon payment (assuming 360 days in a year). From the next coupon payment, the bond will have 5 years to maturity. The current market yield for the bond is 8%.

The par value of the bond is Sh.100.

Required:
The clean price of the bond. (5 marks)

(d) A fixed income analyst has been provided with the following information on a convertible bond and the ordinary share of the issuer:

1. Market price of the bond = Sh.980.
2. Annual coupon = 8.5%.
3. Conversion ratio = 33:1.
4. Market price of the share = Sh.27.75.
5. Annual dividend per share = Sh.2.25.
6. The par value of the bond = Sh.1,000.

Required:
The premium payback period for the convertible bond. (5 marks)
(Total: 20 marks)

0728 776 317

WEDNESDAY: 3 December 2014.   0728 775317   Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE

(a)   Discuss six types of risks that could be faced by an investor in the bond market.   (6 marks)

(b)   Highlight three uncertainties that might affect an interest rate model.   (3 marks)

(c)   (i)   Explain the term "effective duration" in relation to fixed income instruments.   (2 marks)

(ii)   A treasury bond has a duration of 4.50 and a convexity of -39.20. The prevailing interest rates in the economy are expected to change by 0.5%.

Required:
The percentage change in the bond's price.   (3 marks)

(d)   Bob Ochieng, a fixed income analyst, is considering to purchase a callable bond at the securities exchange. The bond is callable at Sh.101.50 every year starting one year from today.

The data below represents a binomial interest rate tree (9% volatility assumed) for valuing a Sh.100 par value 3-year callable bond with a 6.25% coupon rate:
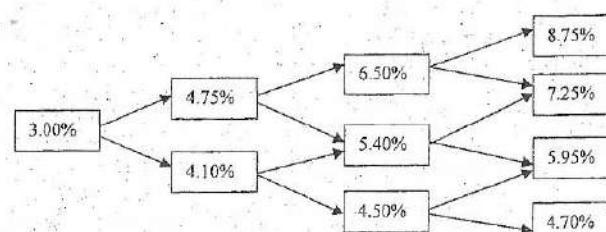
| Today | Year 1 | Year 2 | Year 3 |

Required:
The value of the callable bond today.   (6 marks)
(Total: 20 marks)

QUESTION TWO

(a)   Explain the effect of the following factors to the repurchase agreement (repo) margin:

(i)   Length of the repo.   (1 mark)

(ii)   Quality of the collateral.   (1 mark)

(iii)   Credit quality.   (1 mark)

(iv)   Supply and demand conditions of the collateral.   (1 mark)

(b)   (i)   Discuss two shortcomings of using the "yield on discount" as a measure of a treasury bill's yield.   (4 marks)

(ii)   A treasury bill with 105 days from settlement to maturity is selling for Sh.0.989 per Sh.1 of maturity value.

Required:
The yield on a discount basis of the treasury bill.   (3 marks)

(iii)   A 10-year 9% coupon bond selling for Sh.112 has a par value of Sh.100.

Required:
The current yield of the bond.   (3 marks)

(c)   Cenidia Ltd. has a convertible bond with the following features:

Coupon rate	10%
Market price	Sh.850
Conversion ratio	23
Current price of ordinary share	Sh.16
Dividend per share per annum	Sh.1.20

Required:
The premium payback period.   (6 marks)
(Total: 20 marks)

QUESTION THREE

(a)   Highlight two assumptions of cash flow yield.   (2 marks)

(b)   Explain the following terms in relation to treasury securities:

(i)   Stripping.   (2 marks)

(ii)   Reconstitution.   (2 marks)

(c)   Differentiate between an "intermarket yield spread" and an "option-adjusted spread (OAS)".   (4 marks)

(d)   James Omondi, an investor in fixed income securities is considering to include a zero-coupon bond and a coupon-paying bond in his portfolio. The zero-coupon bond has a maturity value of Sh.100,000 and a tenor of 10 years. The coupon-paying bond has a coupon rate of 10%, face value of Sh.100,000 and term-to-maturity of 5 years.

The investor's required rate of return is 12%.

Required:
(i)   The value of the zero-coupon bond.   (2 marks)

(ii)   The value of the coupon-paying bond.   (3 marks)

(e)   A 365 - day bank certificate of deposit has an initial principal amount of Sh.96.5 million and a redemption amount due at maturity of Sh.100 million. The number of days between settlement and maturity is 350.

Required:
Bond equivalent yield.   (5 marks)
(Total: 20 marks)

QUESTION FOUR

(a)   Evaluate the following methods that are used by governments to distribute new bond issues:

(i)   Regular auction cycle - multiple price method.   (2 marks)

(ii)   Regular auction cycle - single price method.   (2 marks)

(iii)   Ad hoc auction system.   (2 marks)

(iv)   Tap system.   (2 marks)

(b)   Outline three distinct features of a eurobond.   (3 marks)

(c)   (i)   A three-year option free bond with an 8% annual coupon rate has a yield-to-maturity of 9%. One-year and two-year spot rates are 6.5% and 7.0% respectively. The par value of the bond is Sh.1,000.

Required:
The three-year spot rate.   (6 marks)

(ii)   The bond equivalent yield (BEY) spot rate for treasury yields are provided by the following table:

Period	Years	Spot rate (%)
1	0.5	1.20
2	1.0	2.10
3	1.5	2.80
4	2.0	3.30

Required:
The 6 - month forward rate, one year from now.   (3 marks)
(Total: 20 marks)

QUESTION FIVE

(a)   Assess the following coupon bonds offered in the global fixed income financial markets: (2 marks)

(i) Step-up coupon bonds.

(ii) Credit linked coupon bonds. (2 marks)

(iii) Payment-in-kind coupon bonds. (2 marks)

(iv) Deferred-coupon bonds. (2 marks)

(v) Index-linked bonds. (2 marks)

(b) Distinguish between "historical yield volatility" and "implied yield volatility". (4 marks)

(c) The following information relates to three treasury bonds listed at Papua Securities Exchange (PSE).

1. F X D 3/2014/1 YR, a 1-year zero coupon bond trading at a yield to maturity of 5% (Price of Sh.95.2381).

2. F X D 4/2014/2 YR, a 2-year treasury bond with a 6% coupon trading at a yield to maturity of 5.5% (price of Sh.100.9232).

3. F X D 5/2014/3 YR, a 3-year treasury bond with a 7% coupon trading at a yield to maturity of 6% (price of Sh.102.6730).

The coupon is paid annually and the par value of each of the three bonds is Sh.100.00.

Required:
The 2-year and 3-year spot rates using the bootstrapping method. (6 marks)
(Total: 20 marks)

VALUATION AND ANALYSIS OF FIXED INCOME INSTRUMENTS   CSIA PART III SECTION 5

WEDNESDAY: 28 May 2014.

Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE
(a) Summarise five factors that a credit rating agency would consider when assessing the credit quality of a local currency debt.
(5 marks)

(b) Discuss three components of credit risk faced by a corporate bond investor. (6 marks)

(c) Isaac Sang invests in money market instruments. One morning, he observes quoted rates on the following four 182-day money market instruments:

Money market instrument	Quotation basis	Assumed number of days in the year	Quoted rates(%)
W	Discount rate	360	7.33
X	Discount rate	365	7.36
Y	Add-on-rate	360	7.35
Z	Add-on-rate	365	7.45

The par value for each of the money market instruments is Sh.100.

Required:
The bond equivalent yield for each of the above money market instruments. (9 marks)
(Total: 20 marks)

QUESTION TWO
(a) Explain the following types of bonds traded in the international bond markets.

(i) Duo-currency bonds. (2 marks)

(ii) Currency-option bonds. (2 marks)

(b) Distinguish between "modelling risk" and "volatility risk". (4 marks)

(c) As a fixed income analyst, you have been provided with the following binomial interest rate tree of an option free, 12% annual coupon bond with two years to maturity.
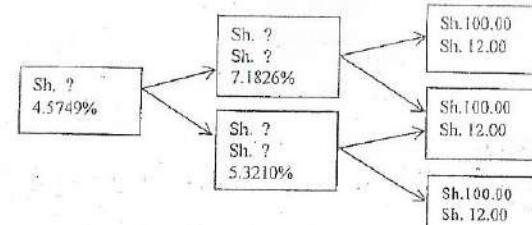
Required:
(i) The value of the bond today. (4 marks)

(ii) The value of the bond and the value of the embedded call option, assuming the bond in (c) (i) above is callable at Sh.105.00 at the end of year 1. (4 marks)

(iii) The value of the bond and the value of the embedded put option, assuming the bond in (c) (i) above is putable at Sh.105.00 at the end of year 1. (4 marks)
(Total: 20 marks)

QUESTION THREE
(a) Outline four characteristics of Cox-Ingersoll-Ross (CIR) model. (4 marks)

(b) The following treasury spot rate curve is provided:

Period	Year	Cash flow (Sh.)	Spot rate (%)
1	0.5	5	4.7
2	1.0	5	4.9
3	1.5	5	5.0
4	2.0	105	5.15

A 10%, 2 year treasury bond issue is priced in the market based on the 2-year treasury yield of 5.2%.

Required:
The arbitrage profit made from stripping the 10%, 2 year treasury bond. (8 marks)

(c) The annual yield to maturity (YTM) for the 182-day and 364-day treasury bills is 4.6% and 5.0% respectively. The following treasury yield curve has been estimated for a 6 months period up to a maturity of 3 years:

Years of maturity	Annual yield to maturity (%)
1.5	5.4
2.0	5.8
2.5	6.4
3.0	7.0

The market price for each issue is Sh.100.00.

Required:
(i) 1.5 - year spot rate. (2 marks)

(ii) 2 - year spot rate. (2 marks)

(iii) 2.5 - year spot rate. (2 marks)

(iv) 3 - year spot rate. (2 marks)
(Total: 20 marks)

QUESTION FOUR
(a) Highlight four roles played by an investment bank during a public offering of a bond. (4 marks)

(b) (i) Evaluate two limitations of using bond duration as a measure of a bond's price sensitivity to interest rate changes. (2 marks)

(ii) A 14% annual-pay coupon bond has six years to maturity. The bond is currently trading at par.

Required:
The modified duration of the bond using a 25 basis points change in yield. (5 marks)

(c) The following information was extracted from the bond segment of Masdaq securities exchange and relates to the trading proceeds of bonds on 21 April 2014.

Abbreviations

FR: floating rate; MTN: Medium term note; FXD: Fixed rate; IFB: Infrastructure bond; TB (182): 182-day treasury bill rate.

Required:

(i) Explain why the government of Suraya's twenty year fixed rate treasury bond's (FXD 1/2012/20Yr) dirty price (101.4508%) is higher than its clean price (9.4288%). (2 marks)

(ii) Evaluate a possible reason why the first lot of government of Suraya infrastructure bond (IFB1/2013/12 Yr) traded at a higher clean price (101.5043%) than the second lot (100.4961%). (2 marks)

(iii) Calculate the annual coupon payment to an investor holding a BMK bank medium term floating rate note (FR(MTN)/2007/7Yr), assuming that the note has a par value of Sh.1,000. (2 marks)

(iv) You are a Certified Securities and Investment Analyst specialising in fixed income analysis at Twin Investment Bank. Your client, John Makhulo, is considering buying either the government of Suraya's two year fixed rate treasury bond (FXD 1/2012/2 Yr) or B&Q medium term note (FRN B&Q – 01/13/5.25).

He intends to invest in either of the bonds with the main objective of earning coupon income for the next four years after which he will sell the bond. Due to the current economic conditions in Surayn, the 182-day treasury bill rate is expected to decline by 200 basis points in the next one month, and then remain at this level indefinitely.

Required:

Advise James Makhulo on the most appropriate bond to invest in. (3 marks)

(Total: 20 marks)

QUESTION FIVE

a) Suggest three reasons that could explain why the yield-to-maturity of any two or more bonds differ. (3 marks)

(b) Evaluate two limitations of investing in a bond with a call option. (2 marks)

(c) Examine four reasons that would make the price of a bond quoted in a securities exchange to fluctuate. (8 marks)

(d) You are provided with the following daily yields of a bond:

Time (t) in days	Yield at time t, Y_t (%)
0	7.555
1	7.536
2	7.547
3	7.530
4	7.551
5	7.525

Required:

(i) The 5-day daily standard deviation of the percentage change in yield assuming continuous compounding. (5 marks)

(ii) The annual yield volatility, given that there are 250 trading days in a year. (2 marks)

(Total: 20 marks)

BONDS LISTED AT THE MASDAQ SECURITIES EXCHANGE — April 21, 2014

Issue No.	Issue Date	Maturity date	Days to maturity	Issued value (Sh.million)	Coupon Rate	Coupon (%)	Traded Yield (%)	Dirty Price (%)	Clean Price (%)	Previous Price (%)	Total Value Traded (Sh)
GOVERNMENT OF SURAYA FIXED RATE TREASURY BONDS											
TWO YEAR BONDS											
FXD 1/2012/2Yr	30-Apr-12	28-Apr-14	7	8,418.05	Fixed	13.826	10.9000	100.0748	100.1872	100.6100	13,500,000
FXD 2/2012/2Yr	27-Aug-12	25-Aug-14	126	15,312.35	Fixed	11.114				100.5716	
SEVEN YEAR BONDS											
FXD 1/2007/7Yr	30-Jul-07	21-Jul-14	91	8,269.85	Fixed	9.7500				99.1454	
EIGHT YEAR BONDS											
FXD 1/2007/8Yr	26-Feb-07	16-Feb-15	301	13,764.30	Fixed	12.7500				100.6982	
FXD 1/2006/9Yr	24-Apr-06	13-Apr-15	357	2,656.90	Fixed	13.5000				103.0000	
ELEVEN YEAR BONDS											
FXD1/2006/11Yr	25-Sep-06	11-Sep-17	1,239	4,031.40	Fixed	13.7500				104.0760	
TWENTY YEAR BONDS											
FXD1/2012/20Yr	27-May-13	01-Nov-32	6,769	4,389.35	Fixed	12.0000	12.3500	101.4508	97.4288	97.4288	1,000,000
TWENTY FIVE YEAR BOND											
FXD1/2010/25Yr	26-Jun-10	28-May-35	7,707	20,192.50	Fixed	11.2500				84.3198	
GOVERNMENT OF SURAYA INFRASTRUCTURE BONDS											
IFB 1/2013/12Yr	30-Sep-13	16-Sep-25	4,165	36,938.31	Fixed	11.0000	10.7000	101.595	101.5043	100.7487	302,000,000
IFB 1/2013/12Yr	30-Sep-13	16-Sep-25	4,165	36,938.31	Fixed	11.0000	10.9000	100.5968	100.4961	100.7487	208,000,000
CORPORATE BONDS			DTC								
URP CORPORATION MEDIUM TERM NOTE PROGRAMME											
URP BD-FXD/2012/7Yr	30-Jul-12	24-Jul-19	1,920	1,480.50	FIXED	13.25%				99.9611	
URP BD-FXD/2012/7Yr	30-Jul-12	22-Jul-19	1,918	195.50	FIXED	13.60%				100.0000	
URP BD-FR/2012/7Yr	30-Jul-12	22-Jul-19	1,918	1.00	T.B (182) + 2%						
LBA BMK LTD FLOATING RATE BOND											
FR(MTN)2007/7Yr	15-Oct-07	31-Oct-14	193	600	T.B (182)+ 1.00%					100.0000	
BMK BANK MEDIUM TERM FLOATING RATE NOTES											
FR (MTN)/2007/7Yr	19-Nov-07	19-Nov-14	212	1,500	T.B (182)+0.5%					100.0000	
FXD (MTN)/2008/7Yr	14-Jul-08	14-Jul-15	440	1,300	FIXED	11.50%				100.0000	
FR (MTN)/2008/7Yr	14-Jul-08	14-Jul-15	449	700	T.B (182) + 1%						
ELKEN LTD. PUBLIC INFRASTRUCTURE BOND OFFER 2019											
FXIB 1/2009/10Yr	02-Nov-09	31-Oct-19	2,018	18,750.00	FIXED	12.40%				99.959	
SANKOM LTD DOMESTIC MEDIUM TERM NOTE											
FR (SANKOM)/2009/5Yr	02-Nov-09	03-Nov-14	196	463.40	T.B (182) + 1.85%					100.0000	
FXD (SANKOM)/2009/5Yr	02-Nov-09	03-Nov-14	196	7,049.60	FIXED	12.25%				100.0000	
PROPERTY FINANCE MEDIUM TERM NOTE											
FXD (PF1/02/2012/7Yr	22-Oct-12	14-Oct-19	2,092	2,069.10	FIXED	13.00%				101.1428	
FR (PF)/2010/7Yr	20-Oct-10	02-Oct-17	1,260	1,166.50	T.B (182) + 3.00%					99.9731	
B&Q BANK MEDIUM TERM NOTE											
FXD B&Q-01/13/5.25	13-Dec-13	08-Mar-19	1,792	3,429.00	FIXED	12.80%				100	
FRN B&Q-01/13/5.25	13-Dec-13	08-Mar-19	1,792	229.00	T.B (182)+2%						

182 - Day Treasury bill rate = 9.871%

	Turnover in Bonds				Total Deals (Bonds)	
	Today	Previous			Today	Previous
	514,500,000	2,162,700,000			51	14

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WEDNESDAY: 4 December 2013.   Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE

(a) (i) Explain three uses of a yield curve.   (6 marks)

(ii) Differentiate between "current yield" and "yield to maturity (YTM)".   (4 marks)

(b) BOB Ltd. has a Sh.250 million, 17% bond outstanding with 8 years to maturity. Due to a decline in interest rates, BOB Ltd. is considering refunding this bond with a Sh.250 million issue of 8 year bond carrying a coupon rate of 15% per annum.

Additional information:
1. The call premium of the old bond will be 6%.
2. The issue costs on the new bond will be Sh.10 million.
3. The unamortised portion of the issue costs on the old bond is Sh.8 million and these could be written off as soon as the old bond is called.
4. BOB Ltd. has a marginal tax rate of 30%.

Required:
Advise BOB Ltd. on whether to undertake this bond refunding decision.   (10 marks)
(Total: 20 marks)

QUESTION TWO

(a) Explain two forms of reinvestment risk faced by investors of callable bonds.   (4 marks)

(b) Describe three types of spread measures in relation to bond pricing.   (6 marks)

(c) Assume that a bond is purchased between coupon periods. The period between the settlement date and the next coupon payment date is 110 days. There are 182 days in the coupon period. The bond has a coupon rate of 12 per cent per annum and a discount rate of 10 per cent. The bond has a face value of Sh.1,000 with 5 annual coupon payments remaining.

Required:
The clean price of the bond.   (7 marks)

(d) A Treasury bill with 100 days from settlement to maturity is selling for Sh.0.9890 per Sh.1.00 of maturity value.

Required:
The yield on a discount basis.   (3 marks)
(Total: 20 marks)

QUESTION THREE

(a) Explain the term "bond immunisation"   (2 marks)

(b) Discuss four factors that could affect the repurchase agreement (REPO) rate.   (8 marks)

(c) An investor expects the yield curve to flatten over the next year, so he sells the 3-year government bonds in the government bond portfolio, replacing a part of them with 1-year government bonds and the remainder with 5-year government bonds so that the modified duration of the portfolio as a whole does not change.

The modified duration for government bonds of 1-year, 3-year and 5-year maturities are shown below:

Maturity	1 year	3 years	5 years
Modified duration	0.996	2.902	4.633

The investor seeks to fulfil the following conditions:
1. The total market value of 1-year and 5-year government bonds to be bought must equal the market value of the 3-year government bonds to be sold.
2. The portfolio's modified duration must remain unchanged.

Required:
The amount of 1-year and 5-year government bonds which must be purchased in order to replace the 3-year government bonds given that Sh.10 million of 3-year government bonds are sold.   (6 marks)

(d) An investor purchases a semi annual bond with a coupon rate of 7% that matures in 8 years. The bond has a par value of Sh.100. The yield to maturity for this bond (on a bond equivalent basis) is 8%.

Required:

The bond's reinvestment income.   (4 marks)
(Total: 20 marks)

QUESTION FOUR

(a) Highlight three key roles played by each of the following stakeholders in the fixed income market:
(i) Issuers.   (3 marks)
(ii) Intermediaries.   (3 marks)

(b) The following information relates to a portfolio of three bonds namely X, Y and Z:

Bond	Coupon (%)	Time to maturity (Years)	Price (%)	Duration
X	3.50	1	100.49	1.00
Y	5.00	2	100.94	1.95
Z	8.50	3	106.81	2.77

The coupon is payable annually.

Required:
(i) The spot rates for year 1, year 2 and year 3.   (4 marks)
(ii) The bond with the highest convexity.   (3 marks)
(iii) The break-even discount rate after 1 year for one year investments so that the holding rate of return of bond Y is exactly zero.   (4 marks)
(iv) The value of the embedded put option in basis points for bond Y given that it is putable after 1 year (strike at 100%). The option adjusted spread (OAS) stands at 145 basis point. The yield spread of that putable bond Y over straight government bond is 95 basis point.   (3 marks)
(Total: 20 marks)

QUESTION FIVE

(a) Distinguish between the following sets of terms:
(i) "Call protection" and "refund protection".   (4 marks)
(ii) "Principal only strips" and "interest only strips".   (4 marks)
(iii) "Credit migration risk" and "market liquidity risk".   (4 marks)

(b) Examine three bond specific arbitrage restrictions that allow bond valuation researchers to develop interest rate models.   (3 marks)

(c) A convertible bond is selling for Sh.800. It has 10 years to maturity, a Sh.1,000 face value and a 10% coupon paid semi-annually. Similar nonconvertible bonds are priced to yield 14%. The conversion price is Sh.50 per share. The ordinary share currently sells for Sh.31.375 per share in the securities exchange.

Required:
The bond's option premium.   (5 marks)
(Total: 20 marks)

CSIA PART III SECTION 5

VALUATION AND ANALYSIS OF FIXED INCOME INSTRUMENTS

THURSDAY: 6 June 2013.   Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE

(a) Explain three features of a bond that could increase the reinvestment risk.   (6 marks)

(b) Balusa owns a 17-year 4.65% coupon bond with a face value of Sh.15 million. The bond is currently priced to yield 4.39% and pays interest semi-annually.

Required:
The interest rate exposure using the full valuation approach, given a 75 basis point increase in the required yield.   (6 marks)

(c) The yields to maturity on five zero-coupon bonds are given below.

Years to maturity	Yield (%)

1	12
2	14
3	15
4	15.5
5	15.7

Required:

(i) The implied forward rate of interest for the third year. (4 marks)

(ii) The rate of interest an investor would receive if he bought a bond at the beginning of the second year and sold it at the beginning of the fourth year. (4 marks)

(Total: 20 marks)

QUESTION TWO

(a) An investor is considering an investment in one of two corporate bonds. Both bonds have a par value of Sh.1,000 and pay coupon interest on an annual basis. The market price of the first bond is Sh.1,079.08. Its coupon rate is 6% and it is due to be redeemed at par in five years. The second bond is about to be issued with a coupon rate of 4% and will also be redeemable at par in five years. Both bonds are expected to have the same yields to maturity.

Required:

Estimate the Macaulay duration of the two bonds that the investor is considering for investment. (10 marks)

(b) Evaluate five factors that affect the intermarket and intramarket yield spread. (10 marks)

(Total: 20 marks)

QUESTION THREE

(a) Discuss the following economic indicators:

(i) Leading economic indicator. (2 marks)

(ii) Lagging economic indicator. (2 marks)

(iii) Coincident economic indicator. (2 marks)

(b) A two year-bond selling at par pays a 10% coupon annually. The interest rate at which the coupon can be invested is 8%.

Required:

(i) The compound growth rate of the two year-bond. (2 marks)

(ii) The total value of investment with reinvested coupon rate of 8%. (2 marks)

(iii) The realised compound yield. (2 marks)

(c) XYZ Limited has just made a loan of Sh.100 million that pays 90-day LIBOR plus a 1.5% margin. The investment analyst of XYZ Limited is concerned that there may be an interest rate decline within the next two months.

The following quotes were obtained from a dealer for 3-month forward rate agreements (FRAs).

Dealer quotes

60-day LIBOR = 0.0450

90-day LIBOR = 0.0440

180-day LIBOR = 0.0420

XYZ Limited takes a short position of Sh.100 million in a 3-month forward rate agreement. At the expiration of the contract 90 days, the 90-day LIBOR is 4.5%.

Required:

The amount XYZ Limited should collect from, or pay to, the dealer at the settlement date. (4 marks)

(d) As a financial consultant in your country, a client requires your advice on whether he should add bonds to his current investment portfolio.

Required:

Summarise four advantages that would accrue to the client by investing in bonds. (4 marks)

(Total: 24 marks)

QUESTION FOUR

(a) The treasury spot rate curve has been provided as follows:

Period	Yield to maturity	Spot rate %
1	0.5	5.0
2	1.0	5.4
3	1.5	5.8
4	2.0	6.4
5	2.5	7.0
6	3.0	7.2

7	3.5	7.4
8	4.0	7.8

The market price of a 4-year 6% coupon non-treasury issue is Sh.91.4083.

Required:

Determine whether the zero volatility spread (Z-spread) relative to the treasury spot rate curve for this issue is 80 basis points, 90 basis points or 100 basis points. (9 marks)

(B) Outline three assumptions of the Black-Derman-Toy (BDT) interest rate model. (6 marks)

(C) A 7%, 8 year bond with a maturity value of Sh.1,000 is selling for Sh.1,063.60. The first call date is three years from now and the call price is Sh.1,030.

Required:

The yield to first call on a bond equivalent basis. (5 marks)

(Total: 20 marks)

QUESTION FIVE

(a) Highlight three motivations for issuing convertible bonds with a call option. (3 marks)

(b) Explain five bond price theorems. (5 marks)

(c) An investor is considering the purchase of an option free high yield corporate bond with a coupon rate of 10% and 9 years remaining to maturity. The price of the bond is Sh.95.7420 and the yield to maturity is 10.75%. The treasury yield curve is flat at 7.5% and the credit spread for the issuer is 325 basis points for all maturities. The reinvestment rate is 5%. At the horizon date, the treasury yield curve remains at 7.5% and the credit spread for the issuer declines to 200 basis points for all maturities.

Required:

One year total return on a bond equivalent basis. (12 marks)

(Total: 20 marks)

CSIA PART III SECTION 5

VALUATION AND ANALYSIS OF FIXED INCOME INSTRUMENTS

WEDNESDAY: 5 December 2012. Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE

(a) Analyse four competitive forces that determine the intensity of the competition in an industry. (4 marks)

(b) Explain three advantages of using the swap curve compared to a government or treasury bond yield curve as a benchmark for evaluating fixed income instruments. (6 marks)

(c) Genken Ltd. has announced the issue of an infrastructure bond with a face value of Sh.50 million and a coupon rate of 12% payable on outstanding principal amounts. The bond has 12 semi-annual coupon payments.

Additional information:

1. On the 6th semi-annual coupon period, the issuer will redeem 44% of the outstanding principal amount.
2. On the 9th semi-annual coupon period, the issuer will redeem 30% of the outstanding principal amount.
3. On the 12th semi-annual coupon period, the issuer will redeem the outstanding principal amount.
4. There are 182 days in the coupon period and the days between the settlement date and next coupon date is 100 days.
5. The yield to maturity of the bond is 10%.

Required:

The clean price of the infrastructure bond. (10 marks)

(Total: 20 marks)

QUESTION TWO

(a) Johnstone Sitaka is considering purchasing a convertible bond issued by Ashling Ltd. The convertible bond has three years to maturity and a coupon rate of 5.75% with coupons being paid annually. The par value of the bond is Sh.100,000. The bond can be converted into 3,000 shares of Ashling Ltd. stock. The stock does not pay dividend and trades at Sh.28.80 per share. Non convertible bonds of equivalent risk and maturity to the Ashling Ltd. bond currently have a yield to maturity of 6%.

Required:

(i) The minimum market price of the bond. (3 marks)

(ii) The premium payback period in years of the bond. (3 marks)

(b) Explain the following yield spread measures:

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(i) Nominal spread. (2 marks)
(ii) Zero volatility spread. (2 marks)
(iii) Option adjusted spread. (2 marks)

(c) A monthly pay security has a monthly cash flow yield of 0.74%.

Required:
The cash flow yield on a bond equivalent basis. (2 marks)

(d) Highlight two limitations of cash flow yield measure. (2 marks)

(e) Celcom Limited has issued a convertible bond with the following features:

Par value = Sh.1,000
Coupon rate = 8.5%
Market price of the convertible bond = Sh.900
Conversion ratio = 30 ordinary shares of Celcom Limited per Sh.1,000 par value of the convertible bond.
Estimated straight value of the bond = Sh.700.

The current price of Celcom Limited's ordinary share is Sh.25 and the dividend per share is Sh.1.00 per annum.

Required:
(i) Conversion value. (1 mark)
(ii) Market conversion price. (1 mark)
(iii) Conversion premium per share. (1 mark)
(iv) Conversion premium ratio. (1 mark)

(Total: 20 marks)

QUESTION THREE

(a) Explain the following theories of term structure of interest rates:

(i) Pure expectations theory. (2 marks)
(ii) Liquidity preference theory. (2 marks)
(iii) Market segmentation theory. (2 marks)
(iv) Preferred habitat theory. (2 marks)

(b) In relation to the information provided to investors by the rating agencies, differentiate between "rating watch" and "rating outlook". (4 marks)

(c) John Mutokah would like to use a binomial model to value a Goldcom Limited products bond with a 5.75% coupon and a maturity of 3 years.

The bond is callable at par every year starting one year from now. Goldcom Limited will call the bonds if their price rose above par.

A binomial interest rate tree for a non callable Goldcom Limited products bond is provided below.

The probability of each interest rate move in the tree is 0.50.

Node contents

Computed value
Coupon
Short term rate
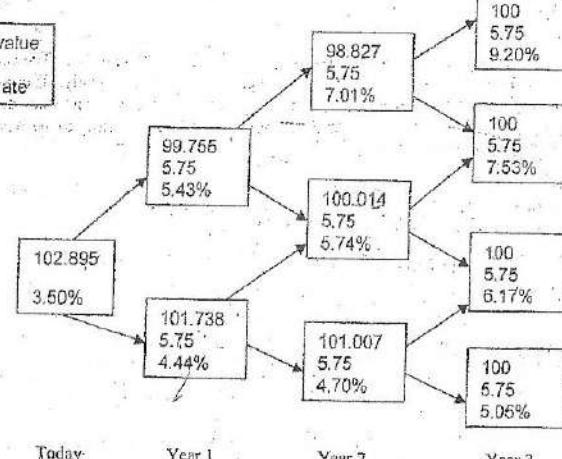
Today   Year 1   Year 2   Year 3

Required:
The current price of the Goldcom Limited callable bond. (8 marks)

(Total: 20 marks)

QUESTION FOUR

(a) Evaluate five factors that have contributed to improved performance of emerging market debt (EMD) in the developing economies. (10 marks)

(b) A 5%, 2 year treasury bond is priced in the market based on a 2 year treasury bond yield of 6%. The prevailing treasury spot rates are provided below.

Period	Spot rate (%)
1	3.0000
2	3.3000
3	3.5053
4	3.9164

Required:
The arbitrage profit generated from the trade. (10 marks)

(Total: 20 marks)

QUESTION FIVE

(a) Explain the following types of risks associated with fixed income instruments:

(i) sovereign risk (2 marks)
(ii) Volatility risk. (2 marks)
(iii) Yield curve risk. (2 marks)
(iv) Prepayment risk. (2 marks)

(b) Explain the following two types of credit risk models used to value corporate bonds:

(i) Structural model. (2 marks)
(ii) Reduced form model. (2 marks)

(c) In relation to corporate bonds, differentiate between "affirmative covenants" and "negative covenants". (4 marks)

(d) A 9% coupon, 5 year option free bond is selling at 112.7953 to yield 6%. When the yield is changed up and down by 10 basis points, the new prices are Sh.112.3373 and Sh.113.2556 respectively.

Required:
The convexity adjustment for a 300 basis point change in yield. (4 marks)

(Total: 20 marks)

VALUATION AND ANALYSIS OF FIXED INCOME INSTRUMENTS

WEDNESDAY: 30 May 2012.
Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE

(a) As an expert on fixed income securities, a client seeks your advice as to whether inflation protected bonds should be a separate asset class distinct from normal bonds.

Required:
Citing three reasons, explain why inflation protected bonds should be considered as a separate asset class. (6 marks)

(b) A market participant seeks to measure yield volatility using the following daily yields for 4 days:

Period, t (years)	Yield y_t (%)
0	5.854
1	5.843
2	5.774
3	5.719
4	5.726

Required:
Annualised standard deviation using 365 days and continuous compounding of yields. (6 marks)

(c) James Mbeti is considering purchasing a 5-year floating rate bond that pays interest semi-annually. The coupon formular is equal to 182-day treasury bill rate plus 30 basis points. The bond has a face value of Sh.1,000. The current 182-day treasury bill rate is 5% (annual rate) and the discount margin is 50 basis points.

Required:
The price of the floating rate bond. (8 marks)

(Total: 20 marks)

QUESTION TWO

(a) Discuss four approaches used when gauging credit risk. (12 marks)

(b) (i) Briefly explain the term "hybrid security". (2 marks)

(ii) Explain one complication arising from the valuation of a hybrid security. (2 marks)

(c) A treasury bond has a market value of Sh.100,000 and a duration of 9.42.

Required:
(i) The price value of a basis point (PVBP) for this bond. (3 marks)

(ii) Interpret the result in (c) (i) above. (1 mark)

(Total: 20 marks)

QUESTION THREE

(a) (i) Explain three considerations that should be taken into account when choosing a term structure model. (3 marks)

(ii) Examine three basic characteristics of the Cox-Ingersoll-Ross (CIR) single factor term structure model. (3 marks)

(b) A 4 year 5.8% coupon bond with a face value of Sh.1,000 is selling to yield 7%. The bond pays interest annually.

Required:
(i) The price change attributable to moving to maturity a year later if the interest rates remain unchanged. (4 marks)

(ii) The price change attributable to a decrease in the discount rate from 7% to 6.2% a year later. (4 marks)

(c) Highlight three embedded options that can be granted to each of the following parties:

(i) Issuer of a bond. (3 marks)

(ii) Bond holder. (3 marks)

(Total: 20 marks)

QUESTION FOUR

(a) Outline five characteristics of Macaulay's Duration. (5 marks)

(b) (i) The annual yield to maturity (YTM) for the 6-month and 1-year treasury bill is 4.6% and 5.0% respectively. These yields represent the 6-month and 1-year spot rates. The following treasury bill yield curve has been estimated for 6-month periods for a maturity period of three years:

Years to maturity	Annual yield to maturity (%)
1.5	5.4
2.0	5.8
2.5	6.4
3.0	7.0

Assume that the price for each issue is Sh.100.

Required:
The 1.5 year spot rate. (8 marks)

(ii) Assume the following treasury spot rates:

Period	Years to maturity	Spot rate (%)
1	0.5	5.0
2	1.0	5.4
3	1.5	5.8
4	2.0	6.4
5	2.5	7.0
6	3.0	7.2
7	3.5	7.4
8	4.0	7.8

All periods are equal to six months.

Required:
The 6-month forward rate, six months from now. (7 marks)

(Total: 20 marks)

QUESTION FIVE

(a) Discuss the benefits that can accrue to a pension scheme from investing in corporate bonds as opposed to government bonds. (5 marks)

(b) Citing one limitation in each case, explain the following yield measures:

(i) Yield to maturity. (1 mark)

(ii) Yield to worst. (1 mark)

(iii) Yield to put. (1 mark)

(iv) Current yield. (1 mark)

(v) Yield to call. (1 mark)

(c) A 91-day Treasury Bill is issued by the government at a discount rate of 8% per annum.

Required:
The annual effective rate of return obtained by an investor who purchases the bill at issue. (3 marks)

(d) An investor intends to use the information from a government bond spot yield curve to calculate the present value of a corporate Eurobond with a term to redemption of exactly five years. The investor will value each payment that is due from the bond at a rate of interest equal to $j = i + 0.01 + 0.00t$, where:

- t is the time in years at which payment is due.
- i is the annual t-year effective spot rate of interest from the government bond spot yield curve.

$i = 0.02t$ for $t \le 5$

The Eurobond pays annual coupons of 10% of the nominal amount of the bond (Sh.100) and is redeemed at par.

Required:
(i) Present value of the Eurobond. (3 marks)

(ii) Gross redemption yield from the Eurobond. (4 marks)

(Total: 20 marks)