kasneb

CPA PART II SECTION 4

CIFA PART II SECTION 4

CCP PART II SECTION 4

QUANTITATIVE ANALYSIS

MONDAY: 30 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) A potential investor in the production of a new type of organic fertilizer estimated the demand function of the product to be AR = 150 – Q.

Where:

AR is the average revenue in thousands of shillings.
Q is the output in tonnes.

The investor estimated the variable cost (VC) per unit tonne associated with the production to be:

VC/tonne = Q – 285 in thousands of shillings.

The firm's cost when not producing any output is estimated at Sh.8,750,000.

Required:

(i) The profit function. (2 marks)

(ii) The level of output that maximises profit. (2 marks)

(iii) The breakeven output. (2 marks)

(b) A game between two players, A and B has the following pay off matrix:

		Player A strategies				
		A_1	A_2	A_3	A_4	A_5
Player B Strategies	B_1	0	– 4	1	2	4
	B_2	– 4	5	– 1	1	9
	B_3	13	5	3	11	9
	B_4	– 2	8	– 7	– 1	– 2

Required:

(i) The optimum strategy for each player. (4 marks)

(ii) The saddle point. (1 mark)

(iii) The value of the game. (1 mark)

(c) An accounting college has two classes, day class and evening class. From a survey conducted by the head of academics in the college, the following results were obtained:

	Classes	
	Day	**Evening**
Number of students	13	15
Average test mark (%)	45	55
Standard deviation (%)	4	5

Required:
Determine whether there is any significant difference in the average test mark between the two classes at 5% level of significance. (8 marks)

(Total: 20 marks)

QUESTION TWO

(a) A baker must decide whether to bake brown bread or white bread for a new market. Demand at the market can either be small or large with probability estimated to be 0.3 and 0.7 for brown bread and white bread respectively.

Additional information:

1. If brown bread is baked and demand proves to be high, the baker may choose not to expand (pay off = Sh.350,000) or to expand (pay off = Sh.420,000).
2. If brown bread is baked and demand is low, there is no reason to expand and the payoff is Sh.310,000.
3. If white bread is baked and demand proves to be low, the choice is to do nothing (Sh.90,000) or to stimulate demand through local advertising. The response to advertising may be either modest or sizeable, with their probabilities estimated to be 0.4 and 0.6 respectively. If it is modest, the pay off is estimated to be Sh.50,000; the pay off grows to Sh.340,000 if the response is sizeable.
4. If white bread is baked and the demand turns out to be high, the payoff is Sh.1,400,000.

Required:

(i) A decision tree showing the payoff and expected monetary value of each alternative decision. (6 marks)

(ii) Advise the management of the bakery on the best product to introduce into the market. (2 marks)

(b) In a choral music competition, 9 contestants were awarded marks in percentage using a music scoring grid by two assessors. The results obtained were given as shown in the table below:

	Marks in % by:	
Contestant	**1st Assessor**	**2nd Assessor**
A	72	76
B	82	80
C	79	78
D	70	73
E	67	70
F	81	85
G	78	69
H	75	83
I	65	68

Required:

(i) The rank correlation coefficient. Interpret your results. (4 marks)

(ii) Coefficient of determination. (1 mark)

(c) In a certain hospital, the arrival rate of patients into the outpatient department is 3 patients per hour and 4 patients are normally attended per hour.

Required:

(i) Service rate. (1 mark)

(ii) Length of queue. (1 mark)

(iii) Length of the system. (1 mark)

(iv) The time a patient takes being actually attended. (2 marks)

(v) The probability that there are more than six patients in the outpatient hospital department. (2 marks)

(Total: 20 marks)

QUESTION THREE

(a) Dolce Ltd. is in the process of launching a new product into the market. Three variables are uncertain; selling price, variable cost and sales volume.

The following information is provided:

Selling price (Sh)	**Probability**
600	0.30
700	0.50
800	0.20
Variable cost (Sh.)	**Probability**
300	0.40
400	0.50
500	0.10
Sales volume (units)	**Probability**
40,000	0.30
50,000	0.50
60,000	0.20

The following random numbers have been provided:

44, 84, 82, 50, 85, 40, 96, 88, 16, 16, 97, 92, 44, 82, 39, 33, 83, 42, 16, 07, 77, 66, 50, 20, 50, 95, 83, 39, 58, 44, 77, 11, 08, 38, 89, 45, 09, 99, 81, 97, 50, 83.

Required:

The average contribution of Dolce Ltd. using Monte Carlo simulation with 10 simulations. (10 marks)

(b) The production manager of Sweet Ltd. is concerned with the fluctuating indirect labour cost in relation to the labour hours worked by the employees.

The following data was collected for the past 12 months.

Month	**Labour hours "000"**	**Indirect labour cost Sh."000"**
January	48	963
February	68	752
March	94	1,032
April	82	1,316
May	46	710
June	78	1,180
July	96	1,456
August	60	770
September	72	1,004
October	62	1,211
November	88	917
December	68	1,190

Required:

Using the ordinary least squares method:

(i) Formulate the indirect cost function. (5 marks)

(ii) Compute the indirect labour cost for 120 labour hours. (2 marks)

(iii) Calculate the coefficient of determination. (3 marks)

(Total: 20 marks)

QUESTION FOUR

(a) Explain the following terms as used in linear programming:

(i) Infeasibility. (2 marks)

(ii) Unboundedness. (2 marks)

(b) A training institution has four lecturers represented as L1, L2, L3 and L4. The Head of department wishes to assign them to handle three topics in quantitative analysis; T1, T2 and T3. This will be done based on competency which is measured in terms of mastery of subject matter and personal preference on the time schedule while satisfying policies and provisions of the institution.

All of the lecturers have taught the topics in the past and have been evaluated with the following scores in the three different topics as follows:

		Topics		
		T1	**T2**	**T3**
Lecturers	**L1**	42	16	27
	L2	48	40	25
	L3	50	18	36
	L4	58	38	60

Required:

(i) The optimal assignment for these three topics. (4 marks)

(ii) The maximum score. (2 marks)

(iii) The lecturer that will not be assigned any topic. (1 mark)

(c) The data given below shows the profits in shillings million made by an economic sector in your country during the various quarters of the given years.

	Profits in quarters			
Year	**Q1**	**Q2**	**Q3**	**Q4**
2016	83	260	215	293
2017	105	383	248	553
2018	140	430	323	588
2019	168	503	340	755

Required:

(i) 3 quarter moving average of the series. (5 marks)

(ii) The deseasonalised profit of the economic sector using the additive model. (4 marks)

(Total: 20 marks)

QUESTION FIVE

(a) With reference to analysis of variances (ANOVA) tests:

(i) Distinguish between one-way and two-way ANOVA tests. (2 marks)

(ii) Outline four assumptions of two-way ANOVA tests. (4 marks)

(iii) Explain the difference between ANOVA tests and T-tests. (4 marks)

(b) In the context of critical path analysis (CPA) method:

(i) Discuss two strengths and two weaknesses of CPA method. (4 marks)

(ii) Explain three practical applications of CPA method. (6 marks)

(Total: 20 marks)

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t Table

cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$	$t_{.999}$	$t_{.9995}$
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02	0.01	0.002	0.001
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.000	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.000	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.000	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	0.000	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.000	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	0.000	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	0.000	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232	3.460
80	0.000	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195	3.416
100	0.000	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174	3.390
1000	0.000	0.675	0.842	1.037	1.282	1.646	1.962	2.330	2.581	3.098	3.300
z	0.000	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.090	3.291
	0%	50%	60%	70%	80%	90%	95%	98%	99%	99.8%	99.9%
	Confidence Level										