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KASNEB

DICT LEVEL I

COMPUTER MATHEMATICS

MONDAY: 23 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) Given the following matrices:

$$A = \begin{pmatrix} 1 & -2 & 3 \\ 4 & 5 & -6 \end{pmatrix} \qquad B = \begin{pmatrix} 3 & 0 & 2 \\ -7 & 1 & 8 \end{pmatrix}$$

$$C = \begin{pmatrix} 4 & -5 \\ -1 & -2 \end{pmatrix} \qquad D = \begin{pmatrix} 2 & -3 \\ 1 & 3 \end{pmatrix}$$

Required:
Perform the following matrix operations:

(i) A + B. (2 marks)

(ii) 2A – 3B. (3 marks)

(iii) Find determinant of matrix C. (2 marks)

(iv) Find the inverse of matrix D. (3 marks)

(b) Describe the following computer codes:

(i) ASCII. (2 marks)

(ii) EBCDIC. (2 marks)

(iii) GRAY CODE. (2 marks)

(c) Convert the real octal number 56.34_8 to its equivalent binary number. (2 marks)

(d) Convert the real hexadecimal number 5B.3A to its equivalent octal number. (2 marks)

(Total: 20 marks)

QUESTION TWO

(a) Convert the following hexadecimal numbers to their equivalent binary form:

(i) $B9E4_{16}$. (1 mark)

(ii) $50C7F6_{16}$. (1 mark)

(b) Convert the following binary numbers to their equivalent hexadecimal form:

(i) 1110001111110_2. (1 mark)

(ii) 111110.101111_2. (1 mark)

(c) Evaluate the following:

(i) $8D07A5_{16} + 734F6_{16}$. (3 marks)

(ii) $67.E9_{16} + A.BCDE_{16}$. (3 marks)

(d) Encode the decimal number 70246 in the 8–4–2–1 BCD code. (2 marks)

(e) Decode 1011 0001 0100 1100 in the 5–4–2–1 BCD code. (3 marks)

(f) Find the binary quotients:

(i) $100.0001 \div 10.1$. (2 marks)

(ii) $1011 \div 11$. (2 marks)

(g) A jar contains 3 red marbles, 7 green marbles and 10 white marbles. A marble is drawn from the jar at random without replacement.

Required:
The probability of drawing a white marble and a red marble. (2 marks)

(Total: 20 marks)

QUESTION THREE

(a) Convert the following numbers:

(i) 0.8_{10} to binary equivalent. (2 marks)

(ii) 25_{10} to excess – 3 code. (3 marks)

(iii) Hexadecimal $D4FE2003_{16}$ to its binary equivalent. (2 marks)

(iv) Hexadecimal DAD_{16} to denary. (3 marks)

(v) 11101_2 to BCD. (3 marks)

(b) Perform the following arithmetic operations and express the results in denary:

(i) 0011010 + 0001100. (2 marks)

(ii) 0011010 – 0001100. (2 marks)

(c) Solve the following equations using the matrix algebra method:

$5x - 2y = 13$

$2x + y = 7$ (3 marks)

(Total: 20 marks)

QUESTION FOUR

(a) Solve the following equations:

(i) $2x + \frac{8}{x} = 10$ (3 marks)

(ii) $\frac{3}{r+1} = \frac{5}{r+2}$ (3 marks)

(b) When my husband and I got married 8 years ago, I was 9/10 of his age. He is 3 years older than me.

Required:
Using an equation, determine the age of the husband (4 marks)

(c) Given that A = 215 and B = 155, perform A – B by 9's compliment subtraction method. (4 marks)

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(d) Mercy and Damaris bought oranges and bananas from a supermarket. Mercy bought 3 oranges and 1 banana for Sh.90 while Damaris bought 1 orange and 2 bananas for Sh.70.

Required:
The cost of an orange and a banana. (3 marks)

(e) Prove that for any sets A and B,

$A = (A \cap B) \cup (A \cap B')$ (3 marks)

(Total: 20 marks)

QUESTION FIVE

(a) Solve the following equations:

(i) $\frac{1}{3}(3x - 2) - \frac{1}{5}(x - 4) = \frac{8}{9}$ (4 marks)

(ii) $\frac{2x - 1}{4} - \frac{x - 7}{5} = 3$ (3 marks)

(b) The first of two sub-groups has 100 items with a mean of 15 and standard deviation of 3. Assume that the whole group has 250 items with a mean of 15.6 and standard deviation of $\sqrt{13.44}$.

Required:
The standard deviation of the second group. (5 marks)

(c) Construct the truth table for the expression:

$W \wedge (u \vee v)$. (4 marks)

(d) Highlight four desirable characteristics of statistical data. (4 marks)

(Total: 20 marks)

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