

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:

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

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

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. (2 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 D4FE2003₁₆ to its binary equivalent. (2 marks)
- (iv) Hexadecimal DAD₁₆ 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)

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

(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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