KASNEB

DICT LEVEL I

COMPUTER MATHEMATICS

MONDAY: 21 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)   Evaluate the value of the following hexadecimal numbers:

     (i) $5A6_{16} - 388_{16}$.   (2 marks)

     (ii) $589_{16} + 746_{16}$.   (2 marks)

(b)   Convert the following numbers to their respective equivalents:

     (i) 100011111100_2 to base 16.   (3 marks)

     (ii)   Hexadecimal $1AE . 11$ to decimal number.   (3 marks)

(c)   Construct a truth table for the following logical statement:

     $(p \wedge q) \vee (\sim r \wedge s)$.   (4 marks)

(d)   Tom and Dick are going for a driving test. Tom estimates that his chances to pass the test as 70% and Dick estimates his chances of passing the same test as 80%. Tom and Dick take their tests independently.

     Required:
     (i)   The probability that at most one of the two friends will pass the test.   (2 marks)

     (ii)   The probability that at least one of the two friends will pass the test.   (2 marks)

(e)   Let P be Charo reads newspapers, let Q be Charo reads magazines, let R be Charo reads novels.

     Required:
     Write each of the following statements in logical symbolic form:

     (i)   Charo reads newspapers and magazines, or he does not read newspapers and novels.   (1 mark)

     (ii)   It is not true that Charo reads newspapers but not novels.   (1 mark)
                                                      (Total: 20 marks)

QUESTION TWO
(a)   A computer uses 6 – bit BCD code with odd parity.

     Show how the computer would store the name ERIC.   (3 marks)

(b)   Encode the name "AUDREY" in the following numbering systems:

     (i)   Binary EBCDIC.   (3 marks)

     (ii)   ASCII – 8.   (3 marks)

(c)   Given that 0110 0011 1001 1011 is the XS – 3 code for the decimal A.

     Required:
     The XS – 3 code for the (10s) complement of A, without decoding A.   (3 marks)

(d)   Find the radix – minus – one (15s) complement and the (16s) complement of the following:

   (i) $2A4E61_{16}$.   (2 marks)

   (ii) $A1B2C300_{16}$.   (2 marks)

(e)   Find the sum of the following hexadecimal digits:

   (i)   B + Z.   (1 mark)

   (ii)   E + E.   (1 mark)

   (iii)   C + 6.   (1 mark)

   (iv)   4 + 9.   (1 mark)
                                                                                         (Total: 20 marks)

QUESTION THREE
(a)   Convert the following numbers:

   (i) 0.3_{10} to its binary equivalent.   (1 mark)

   (ii) 0.4_{10} to its octal equivalent.   (1 mark)

   (iii) 43.0276_8 to its binary equivalent.   (1 mark)

   (iv) $3E7_{16}$ to its decimal equivalent.   (1 mark)

(b)   Perform the following arithmetic operations:

   (i) $333.567_8 + 47.4747_8$.   (2 marks)

   (ii) 111011×1011.   (2 marks)

   (iii) $47B6_{16} + 9C75_{16}$.   (2 marks)

   (iv) $1011011 \div 111$.   (2 marks)

   (v) $110.001 - 11.111$.   (2 marks)

(c)   Prove the following sets:

   (i) $(A \cap B) \; U \; (\overline{A} \cap B) = B$ (3 marks)

   (ii) $\overline{(A \cap B)} = (\overline{A} \cup \overline{B})$ (3 marks)
                                                                                         (Total: 20 marks)

QUESTION FOUR
(a)   Solve the following system of linear equations using the elimination method:

$$\frac{2x}{3} + \frac{1}{4}y = \frac{-3}{2}$$

$$\frac{1}{2}x - \frac{1}{4}y = -2$$
                                                                                              (4 marks)

(b)   Solve for x and y in the following matrices:

$$2 \left[\begin{pmatrix} 3x & -1 \\ 8 & 5 \end{pmatrix} + \begin{pmatrix} 4 & 1 \\ -2 & y \end{pmatrix} \right] = \begin{pmatrix} 26 & 0 \\ 12 & 8 \end{pmatrix}$$

                                                                                              (4 marks)

(c)   Simplify:

A (B + C) given the following matrices:

$$A = \begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix}, \qquad B = \begin{bmatrix} -2 & 0 \\ 4 & 2 \end{bmatrix} \quad \text{and} \quad C = \begin{bmatrix} 1 & 1 \\ 3 & 2 \end{bmatrix}$$

(3 marks)

(d)   (i)   Find the inverse of matrix $A = \begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix}$

(1 mark)

(ii)   Show that $A A^{-1} = I = A^{-1} A$.

(2 marks)

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

$-3x + 4y = 5$

$2x - y = -10$

(3 marks)

(f)   Determine the value of x, given that the following matrix is singular:

$$\begin{bmatrix} 2x & 4 \\ 49 & 7 \end{bmatrix}$$

(3 marks)
(Total: 20 marks)

QUESTION FIVE
(a)   Explain the following terms as used in statistics:

(i)   Simple random sampling.   (2 marks)

(ii)   Systematic sampling.   (2 marks)

(iii)   Precision.   (2 marks)

(iv)   Sample size.   (2 marks)

(b)   The following data relate to a company employing various classes of employees located in two branches, A and B of your county and their respective weekly salary scales:

Weekly salary (Sh.)	Frequency Branch A	Branch B
1,000-2,000	9	8
2,000-3,000	15	10
3,000-4,000	20	13
4,000-5,000	12	20
5,000-6,000	18	16
6,000-7,000	8	15
7,000-8,000	12	11
8,000-9,000	6	7

Required:
(i)   Mean salary of each branch.   (4 marks)

(ii)   The median salary of each branch.   (4 marks)

(iii)   The mean deviation of branch A.   (4 marks)
(Total: 20 marks)

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