kasneb

DICT LEVEL I

COMPUTER MATHEMATICS

MONDAY: 20 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) Perform the following arithmetic operations:

(i) $465.37_8 + 31.613_8$. (2 marks)

(ii) $4617263_8 - 1423735_8$. (2 marks)

(b) Perform the following hexadecimal operations:

(i) $1 + 5 + C$. (1 mark)

(ii) $1 + E + 6$. (1 mark)

(iii) $C868_{16} + 72D9_{16}$. (2 marks)

(iv) $72A4_{16} - 4E86_{16}$. (2 marks)

(c) Find the radix – minus – one (15's) complement and the radix (16's) complement for each of the following:

(i) $5COF8_{16}$. (2 marks)

(ii) 2A7600. (2 marks)

(d) Convert the decimal number 13.6875 to binary form. (2 marks)

(e) Perform the following binary operations:

(i) 1001 + 110 + 110 + 1011. (2 marks)

(ii) 1101.101 – 11.10111. (2 marks)

(Total: 20 marks)

QUESTION TWO

(a) Find the value of the following matrices:

(i) $3\begin{bmatrix} 2 & -5 & 1 \\ 3 & 0 & -4 \end{bmatrix} - 2\begin{bmatrix} 1 & -2 & -3 \\ 0 & -1 & 5 \end{bmatrix} + 4\begin{bmatrix} 0 & 1 & -2 \\ 1 & -1 & -1 \end{bmatrix}$ (4 marks)

(ii) $\begin{bmatrix} 1 & 6 \\ -3 & 5 \end{bmatrix}\begin{bmatrix} 4 & 0 \\ 2 & -1 \end{bmatrix}$ (3 marks)

(b) Find the inverse of matrix **B.**

$$\mathbf{B} = \begin{bmatrix} 2 & -3 \\ 1 & 3 \end{bmatrix}$$ (2 marks)

(c) Given the matrix $\mathbf{A} = \begin{pmatrix} 1 & 2 & 0 \\ 3 & -1 & 4 \end{pmatrix}$ and A^T being transpose of matrix A:

Find AA^T (4 marks)

(d) Consider the following sets:

A = {1}
B = {1, 3}
C = {1, 5, 9}
D = {1, 2, 3, 4, 5}
E = {1, 3, 5, 7, 9}
U = {1, 2, . . ., 8, 9}

Required:

(i) A∩(BUE). (2 marks)

(ii) (B∩F) U (C∩E). (3 marks)

(iii) (A∩D) / B. (2 marks)

(Total: 20 marks)

QUESTION THREE

(a) Let **p** be "it is cold" and let **q** be "it is raining".

Give a simple verbal sentence which describes the following:

(i) $q \vee \sim p$ (1 mark)

(ii) $\sim p \vee \sim q$ (1 mark)

(iii) $\sim \sim q$ (1 mark)

(iv) $q \wedge \sim p$ (1 mark)

(b) Prove that the operation of disjunction can be written in terms of the operation of conjunction and negation
$p \vee q \equiv \sim (\sim p \wedge \sim q)$ (4 marks)

(c) Show that "p implies q and q implies p" is logically equivalent to the biconditional "p if and only if q" that is
$(p \rightarrow q) \wedge (q \rightarrow p) \equiv p \leftrightarrow q$ (3 marks)

(d) Show that the biconditional $p \leftrightarrow q$ can be written in terms of the three connectives using $\vee$, $\wedge$ and $\sim$ (2 marks)

(e) Find the internal representation of 907 if the computer uses a 32-bit memory location to store each number. (3 marks)

(f) Perform the following arithmetic conversions:

(i) 43027_8 to binary form. (2 marks)

(ii) 11100.1011011011_2 to hexadecimal. (2 marks)

(Total: 20 marks)

QUESTION FOUR

(a) Solve the following linear equations:

(i) $6x - 8 + x + 4 = 2x + 11 - 5x$ (2 marks)

(ii) $\frac{x-2}{2x+3} = \frac{3}{7}$ (2 marks)

(b) Solve the following simultaneous equations by elimination method:

(i) $x - 2y = 5$
$-3x + 6y = -10$ (3 marks)

(ii) $\frac{2x}{3} + \frac{y}{2} = 8$

$\frac{x}{6} - \frac{y}{4} = -1$ (4 marks)

(c) In a survey of 60 households in a certain village, the results were as given below:

25 households practice coffee farming
26 households practice tea farming
26 households practice dairy farming
9 households practice both coffee and dairy farming
11 households practice both coffee and tea farming
8 households practice tea and dairy farming
8 households practice neither cash crop farming nor dairy farming

Required:

(i) A Venn diagram to represent the above information. (3 marks)

(ii) The number of households who practice all the three types of farming. (3 marks)

(iii) The number of households who practice only one type of farming. (3 marks)

(Total: 20 marks)

QUESTION FIVE

(a) The table below shows marks of a continuous assessment test in computer mathematics:

Marks obtained out of 20	20	19	18	17	16	15	14	13	12	10	9
Number of students	4	6	2	7	1	2	7	2	1	2	1

Required:

(i) The mean mark. (4 marks)

(ii) The variance of the marks. (4 marks)

(iii) The standard deviation of the marks. (3 marks)

(b) In Chauringo Business College, 25% of the students failed Mathematics, 15% of the students failed Financial Accounting and 10% of the students failed in both Mathematics and Financial Accounting.

A student was selected at random.

Required:

(i) The probability that the student selected failed Mathematics given that he failed Financial Accounting. (3 marks)

(ii) The probability that the student selected failed Financial Accounting given that he failed Mathematics. (3 marks)

(iii) The probability that the student selected failed Mathematics or Financial Accounting. (3 marks)

(Total: 20 marks)

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