Seat No.	

B.C.A. (Part-II) (Semester-IV) Examination, November-2016
MATHEMATICAL FOUNDATION
Computer Mathematics (Paper-405)
Sub. Code : 63407

Day and Date : Thursday, 03-11-2016 **Total Marks : 80**
Time : 10.30 a.m. to 1.30 p.m.

Instructions :
1) **Question No. 8 is compulsory.**
2) **Attempt any four questions from remaining 7 questions.**
3) **Figures to the right indicate full marks.**
4) **Use of non programmable calculator is allowed.**

Q1) a) If p and q are true and r and s are false statements, find the truth value of the following statements:

i) $(p \wedge q) \vee r$ ii) $p \wedge (r \rightarrow s)$

iii) $(p \vee s) \leftrightarrow (q \wedge r)$ iv) $\sim (p \wedge \sim r) \vee (\sim q \vee r)$

b) Find the value of x, if $\begin{vmatrix} x+2 & 1 & -3 \\ 1 & x-3 & -2 \\ -3 & -2 & 1 \end{vmatrix} = 0$

[16]

Q2) a) Define the terms: Digraph and weighted graph. Give an example of each.

b) If A and B are subsets of the universal set X and $n(\text{X}) = 50$, $n(\text{A}) = 35$, $n(\text{B}) = 20$ and $n(\text{A} \cap \text{B}) = 10$, find

i) $n(\text{A} \cup \text{B})$ ii) $n(\text{A}' \cap \text{B}')$

iii) $n(\text{A}' \cap \text{B})$ iv) $n(\text{A} \cap \text{B}')$

[16]

P.T.O.

Q3) a) Define scalar matrix. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ then show that $A^2 - 4A$ is a scalar matrix.

b) Define the terms path and cycle in graph theory. Construct a graph of 2-regular graph on 6 vertices.

[16]

Q4) a) Define cartesian product. If $A = \{1, 2, 3\}$, $B = (2, 4\}$ then find

i) $A \times B$ ii) $B \times A$

iii) $(A \times B) \cap (B \times A)$

b) Define Tautology. Using truth table, examine whether the following statement pattern is tautology, contradiction or contingency. $(p \wedge \sim q) \leftrightarrow (p \rightarrow q)$.

[16]

Q5) a) Define inverse of a matrix. Show that inverse of matrix $A = \begin{bmatrix} 2 & 1 & 3 \\ 1 & 0 & 1 \\ 2 & 1 & 1 \end{bmatrix}$ exists and find its inverse.

b) Symbolize the following statements.

i) He swims iff the water is warm

ii) If water is warm then he swim

iii) If water is not warm then he does not swim

iv) He swims and water is warm

[16]

Q6) a) Test whether the following statements are true or false.

i) There exists a 3-regular graph on nine vertices

ii) Every closed walk is a cycle

iii) In any complete graph K_n, number of edges is equal to $\frac{n(n-1)}{2}$

iv) In any graph, the sum of the degrees of all the vertices is equal to twice the number of edges

b) Define the terms: Conjunction and Disjunction. Without using truth table, show that $p \wedge (q \vee \sim p) \equiv p \wedge q$.

[16]

Q7) a) Define power set and obtain power set of $A = \{a, b, c\}$. Using venn diagram represent the following.

i) $A' \cup B'$ ii) $A \cap B'$

b) Define symmetric matrix and give an example of it. If $A = \begin{bmatrix} 5 & 4 \\ 4 & 3 \end{bmatrix}$, $B = \begin{bmatrix} -3 & 4 \\ 4 & -5 \end{bmatrix}$, find $|A|, |B|$ and show that AB is a nonsingular matrix.

[16]

Q8) a) Define the terms: Subset and Finite set.

If $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6\}$, $C = \{4, 5, 6, 7, 8\}$ and universal set $X = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ then verify the following.

i) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

ii) $(A \cap B)' = A' \cup B'$

iii) $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

b) Define square matrix. Show that the matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ satisfy the equation $A^2 - 5A - 2I = 0$, where I is unit matrix.

[16]

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