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B.Sc. (IT) (Sem- 1st)

MATHEMATICS – I

Subject Code: BMAT0-105

Paper ID: [130404]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a) If A and B be two sets, then show that $A - B = A \cap B^c$.

b) In a joint family of 12 persons, 7 take tea, 6 take milk and 2 take neither. How many members take both tea and milk?

c) Prove: $\sim(p \vee q) \leftrightarrow (\sim p) \wedge (\sim q)$, using truth table.

d) How many relations one can define from a set of 10 elements to another set of 8 elements? Justify your answer.

e) Under what conditions a constant function can be one to one?

f) Find domain and range of $f(x) = \frac{|x-2|}{2-x}$.

g) Draw a simple graph with 4 vertices.

h) How many edges must a planar graph have if it defines 5 regions and has 6 nodes?

i) Prove: $A(adj.\ A) = |A|I$.

j) Find the minor of a_{12} of the matrix $A = [3\ \ -\ 1\ 5\ 6\ ]$.

Section – B **(5 marks each)**

Q2. Prove that if f is a bijection, then $\left(f^{-1}\right)^{-1} = f$.

Q3. Show that $(a + b + c)$ is a root of the equation: $|a - x\ c\ b\ c\ b - x\ a\ b\ a\ c - x\ | = 0$.

Q4. Prove the validity of the statement: "If a man is bachelor, he is happy. If a man is unhappy, he dies young. Therefore, bachelors die young."

Q5. Prove that a simple undirected graph G is a tree if and only if G is connected and has no cycle.

Q6. Prove that if a graph G has more than two vertices of odd degree, then there can not be any Euler path in G.

Section – C **(10 marks each)**

Q7. (a). Solve the following system of equations:

$2x - y + 4z = 18; \quad - 3x + z =- 2; \quad - x + y = 0.$

(b). Prove that $A\times(B - C) = (A\times B) - (A\times C)$.

Q8. (a). Let $X = Y = Z = R$ and let $f: X\rightarrow Y$ and $g: Y\rightarrow Z$, are such that $f(x) = 2x + 1$, $g(y) = y/3$, verify that $(gof)^{-1} = f^{-1}og^{-1}$.

(b). Let G be a connected planar graph with 'p' vertices and 'q' be the edges where $p \geq 3$. Prove that $q \leq 3p - 6$.

Q9. (a). Prove that a graph G is a tree if and only if G has no cycles and $|E| = |V| - 1$; where $|E|$ and $|V|$ denote the number of edges and number of vertices of graph G respectively.

(b). Let $\{A_1, A_2, ..., A_n\}$ be a partition of set A, let B be any non-empty subset of A. Prove that $\{\cup_{i=1}^{n} A_i\cap B;\ such\ that,\ A_i\cap B\neq\phi\}$ is a partition of $A\cap B$.