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Total No. of Questions : 07] [Total No. of Pages : 03

BCA (Sem. - 2nd)
MATHEMATICS - I
(Discrete Mathematics)
SUBJECT CODE : BC - 203
Paper ID : [B0207]

[Note : Please fill subject code and paper ID on OMR]

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

Instruction to Candidates:

1) Section - A is **Compulsory**.
2) Attempt any **Four** questions from Section - B.

Section - A

Q1) ***(10 × 2 = 20)***

a) Prove : If A is a subset of the null set ϕ, then $A = \phi$.

b) Show that the following argument is not valid :

S_1 : All students are lazy.

S_2 : Nobody who is wealthy is a student.

S : Lazy people are not wealthy.

c) Let R be the relation on the set N of positive integers defined by the equation $x^2 + 2y = 100$. Find the domain of R.

d) Construct the truth table of $\sim(\sim p \wedge q) \vee q$

e) Define Quantifiers.

f) Find the first five terms of a sequence $a_0, a_1, a_2 \ldots\ldots, a_n, \ldots\ldots$ satisfying the given recurrence relation and initial conditions

$a_n = a_{n-1} + 5$ if $n \geq 1$, $a_0 = 5$

g) Define multigraphs.

h) Draw the graph G whose adjacency matrix A is

$$A = \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix}$$

i) Define the out degree and indegree of a vertex v.

j) What do you mean by graph coloring?

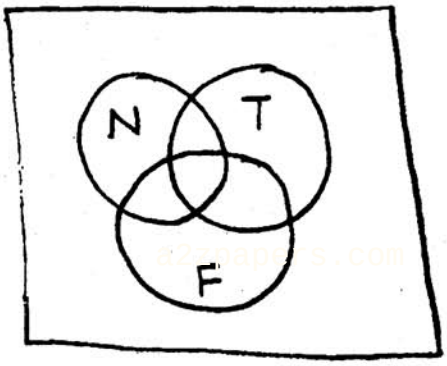
Section - B

(4 × 10 = 40)

Q2) In a survey of 60 people, it was found that 25 read Newsweek magzine, 26 read time, and 26 read Fortune. Also 9 read both Newsweek and Fortune, 11 read both Newsweek and Time, 8 read both Time and Fortune and 8 read no magzine at all.

(a) Find the number of people who read all three magzines.

(b) Fill in the correct number of people in each of the eight regions of the following venn diagram (Here N, T and F denote the set of people who read Newsweek, Time, and Fortune respectively).



(c) Determine the number of people who read exactly one magzine.

Q3) (a) Prove $(A \cup B) \cap (A \cup B^C) = A$
(where B^C stands for complement of B)

(b) Let A = {1, 2, 3, 4, 6} and let R be the relation on A defined by "x divides y".

(i) Write R as a set of ordered pair.

(ii) Draw the directed graph of R.

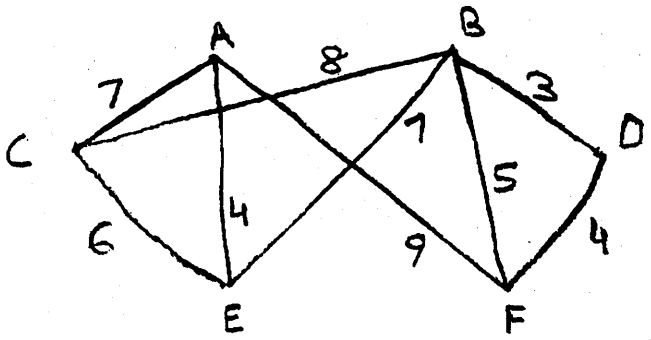
Q4) (a) Show the equivalence of the following
$[d \rightarrow ((\sim a) \wedge b) \wedge c]$ and $\sim [(a \vee (\sim (b \wedge c))) \wedge d]$

(b) Let f : R → R be defined by $f(x) = 2x - 3$.

(i) Find f^{-1} (ii) Find the domain of f^{-1}

Q5) (a) What do you mean by minimal spanning tree. Discuss krusbal's algorithm to find the minimal spanning tree.

(b) Find the minimal spanning tree of the graph G.



Q6) What is graph traversal? Discuss breadth first search. Give example to support your answer.

Q7) (a) The n^{th} term a_n of the sequence $a_1, a_2, \ldots, a_n, \ldots$ satisfies the recurrence relation $a_n = 7\,a_{n-1} - 12a_{n-2} + 6$, $n \geq 3$ with initial conditions $a_1 = 2$ and $a_2 = 8$. Prove that $a_n = 4^n - 3^n + 1$, $n \geq 1$.

(b) Discuss any (one) graph optimization algorithm.

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