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BCA (Sem. – 1^{st})

MATHEMATICS - I

SUBJECT CODE : BSBC – 103 (2011 Batch)

Paper ID : [B1110]

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) Let set A = {1, 2, 3, 4} and set B = {x : x is positive integer and $x^2 < 18$} is the set A equal to set B? Give reasons.

b) Define the term Forest. Give an example.

c) Let T be a relation from set A = {1, 2, 3, 4, 5} to set B = {Red, White, Blue, Green} defined by T = {(1, Red), (1, Blue), (3, Blue), (4, Green)} Find the matrix M representing the relation T.

d) Show, by a counter example, that R and S may be transitive relations on a set A, but RUS need not be transitive.

e) Let p denote "He is rich" and q denote "He is happy". Write each of the following statement in symbolic form

(i) It is necessary to be poor in order to be happy.

(ii) If he is rich, then he is unhappy.

f) Construct the truth table of $\sim p \rightarrow (q \rightarrow p)$.

g) Find the value of $(10.1)^5$ using binomial theorem.

h) Solve the recurrence relation $a_r + a_{r-1} + a_{r-2} = 0$.

i) Give an example of a graph that has an Euler circuit and is also an Hamiltonian Circuit.

j) Define chromatic number of a graph G.

Section - B

(4 × 10 = 40)

Q2) (a) Prove the De Morgan's law :

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

Where C stands for compliment of a set.

(b) Use method of induction to prove that

$$1 + 4 + 7 + \ldots\ldots.. + (3n - 2) = \frac{n(3n-1)}{2}.$$

Q3) (a) Using truth tables prove that disjunction distributes over conjunction

(b) Determine the validity of the argument.

$p \rightarrow q, \sim q \vdash \sim p$

Q4) (a) Prove that a graph G has a Hamiltonian circuit if $e \geq \frac{n^2 - 3n + 6}{2}$, where n is the number of vertices and e the number of edges in G.

(b) Define minimal spanning tree. Give its two basic properties.

(c) How many binary trees are possible on 3 vertices?

Q5) (a) Find an explicit formula for the recurrence relation :

$a_o = 1; a_n = a_{n-1} + 2.$

(b) Obtain the term independent of x in the expansion of $\left(2x - \frac{1}{x}\right)^{10}$.

(c) Find the Fourth term from the end in the expansion of $\left(\frac{3}{x^2} - \frac{x^3}{6}\right)^7$.

Q6) (a) Prove that in any graph, there are an even number of vertices of add degree.

(b) Prove that the proposition $(p \wedge q) \wedge \sim(p \vee q)$ is a contradiction.

(c) Define a tautology and give an example.

Q7) (a) Prove that the following are equivalent for a graph G :

(i) G is 2-colorable.

(ii) G is bipartite.

(iii) Every cycle of G has even length.

(b) In a survey of 80 people, it was observed that 30 read Hindustan Times, 25 read Times of India, 28 read The Tribune, 15 read both Hindustan Times and The Tribune, 18 read Time of India and The Tribune, 20 read both Hindustan Times and Times of India and 5 read all the news paper. Find

(i) number of people who read at least one of the three news papers.

(ii) number of people who read no news paper.

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