Roll No. ....

Total No. of Questions : 07] [Total No. of Pages : 02

BCA (Sem. - 1st)

MATHEMATICS - I

<u>SUBJECT CODE</u> : BSBC - 103 (2011 & Onward)

<u>Paper ID</u> : [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)***

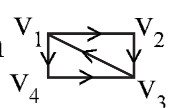
a) Form the truth table of $7(P \wedge Q) \rightleftharpoons (7P \vee 7Q)$

b) How many distinct truth table for formula involving n-variables can be formed.

c) Define Bipartite graph.

d) Determine the equivalence classes generated by elements of Z modulo 2.

e) Determine whether the sequence $\{a_n\}$ is a solution of the recurrence relation $a_n = a_{n-1} + 2a_{n-2} + 2n - 9$ if $a_n = -n+2$.

f) Is the directed graph 

strongly connected?

g) Give an example of a relation that is irreflexive antisymmetric and transitive.

h) Let p(x) denote the statement $x > 3$. What are the truth values of p(4) and p(2).

i) Show that $A \subseteq B \Leftrightarrow 7B \subseteq 7A$

j) What is the degree of $a_n = 3a_{n-1} + 4a^2_{n-2} + 5a_{n-3}$.

Section - B

(4 × 10 = 40)

Q2) a) Show that every equivalence relation on a set generates a unique partition of the set.

b) State US, ES, UG and EG rules of inference. Also show, from $(\exists x)\,(F(x) \vee S(x)) \Rightarrow (y)\,[M(y) \rightarrow W(y)]$ and $[\exists y][M(y) \wedge 7w(y)]$ the conclusion $(x)\,[F(x) \rightarrow 7\,S(x)]$ follows.

Q3) a) Derive the relation valid, $n! \geq 2^{n-1}, n = 1, 2, 3$ using mathematical Induction.

b) Solve the recurrence relation
$S(k) - 7S(k-1) + 10S(k-2) = 6 + 8k$, $S(0) = 1$, $S(1) = 2$.

Q4) a) Let $A = \{1, 2, ..., 6\}$, $B_1 = \{1, 3, 5\}$, $B_2 = \{1, 2, 3\}$. Find the max sets generated by B_1 and B_2.

b) Show that $M_{R \overline{O} S} = M_{S \overline{O} R}$ where $M_R = \begin{pmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{pmatrix}$ $M_S = \begin{pmatrix} 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{pmatrix}$

Q5) a) Show that the vertex connectivity of a graph G is less than or equal to the edge connectivity of G. i.e. $K(G) \leq \lambda(G)$.

b) State and prove Euler's theorem.

Q6) a) Show that the set of divisors of a positive integer n is recursive.

b) Discuss a spanning tree with an example.

Q7) a) Find the inverse of $\begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$

b) Find the symmetric and skew-symmetric matrices from $\begin{bmatrix} 3 & -2 & 6 \\ 2 & 7 & -1 \\ 5 & 4 & 0 \end{bmatrix}$.

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