M.C.A. Sem - I (Choice Based Credit System 2011 & 2012 Course) :
SUMMER - 2019
SUBJECT : DISCRETE STRUCTURES – I

Day : Wednesday
Date : 24/04/2019

S-2019-2162

Time : 02.00 PM TO 05.00 PM
Max. Marks : 100

N.B.

1) Attempt **ANY FOUR** questions from Section – I and attempt **ANY TWO** questions from Section – II.
2) Figures to the **RIGHT** indicate **FULL** marks.
3) Answers to both the sections should be written in SAME answer book.
4) Use of non-programmable **CALCULATOR** is allowed.

SECTION – I

Q.1 Prove or Disprove $(\sim P \wedge (P \vee Q)) \rightarrow Q$ is Tautology. **(15)**

Q.2 If the function $f : R \rightarrow R$ be given by $f(x) = x^2 - 2x - 3$ and the function $g : R \rightarrow R$ be defined by $g(x) = 3x - 4$, find (gof)x and (fog)x . **(15)**

Q.3 Find n *if* $P(n,4) = 42P(n,2)$. **(15)**

Q.4 For any integer $n \geq 1$, prove that $1 + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + ... + \frac{1}{\sqrt{n}} \geq \sqrt{n}$. **(15)**

Q.5 Show that $x \times (y \cap z) = (x \times y) \cap (x \times z)$. **(15)**

Q.6 Write short notes on : **(15)**
i) Rules of Inference for predicate logic.
ii) N-ary relations and their applications.

SECTION – II

Q.7 Describe Warshall's algorithm. Use this algorithm find transitive closures of their relations on {a,b,c,d,e} {(a,c) (b,d) (c,e) (d,a) (e,b) (e,c)}. **(20)**

Q.8 a) Show that the following argument is a valid argument. **(10)**

$H_1 : P \rightarrow Q$

$H_2 : P$

$C : Q$

b) State and prove Lame's theorem. **(10)**

Q.9 a) Suppose the relations R_1 and R_2 on a set A are represented by the matrices **(10)**

$$MR_1 = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} \quad and \quad MR_2 = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}$$

Find $R_1 \cup R_2$ *and* $R_1 \cap R_2$.

b) Illustrate Pigeonhole principle with example. **(10)**

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