M.C.A. SEM - I (CHOICE BASED CREDIT SYSTEM 2011 & 2012 COURSE) : SUMMER - 2018

SUBJECT: DISCRETE STRUCTURES – I

Day: **Friday** Time: **02.00 PM TO 05.00 PM**

Date: **04/05/2018** **S-2018-1785** Max. Marks: 100

N.B.:

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

SECTION-I

Q.1 **a)** Construct the Truth - Table for. **(07)**
$(\sim p \leftrightarrow \sim q) \leftrightarrow (p \leftrightarrow q)$

b) Show that $\sim(p \leftrightarrow q)$ and $(p \wedge \sim q)$ are Logically equivalent. **(08)**

Q.2 Show that the premises " A student in this class has not read the book" and "Everyone in this class passed the first exam" imply the conclusion "Someone who passed the first exam has not read the book". **(15)**

Q.3 **a)** Find fog and gof, where $f(x) = x^2 + 1$ and $g(x) = x + 2$, are functions from $\mathbb{R}$ to $\mathbb{R}$. **(07)**

b) Use mathematical induction to show that **(08)**
$1 + 2 + 2^2 + ... + 2^n = 2^{n+1} - 1$.

Q.4 **a)** How many ways are there to select five players from a 10 member tennis team to make a trip to a match at another school? **(07)**

b) Show that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$. **(08)**

Q.5 **a)** Draw the Hasse diagram for the poset $(\{1, 2, 3, 4\}, \leq)$. **(07)**

b) Let $A = \{2,3,4,5\}$ and $R = \{(2,3), (3,2), (3,4), (3,5), (4,3), (4,4), (4,5)\}$ be a relation on A. Draw the diagraph for R. **(08)**

Q.6 Write short notes on: **(15)**

a) Pigeon hole principle with example

b) Principle of Resolution

P. T. O.

SECTION-II

Q.7 Describe Warshalls algorithm. Use this algorithm to find the transitive closure of the relation $\{(a,c),(b,d),(c,a),(d,b),(e,d)\}$. **(20)**

Q.8 a) Let R be the relation represented by the matrix **(10)**

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

Find the matrix representing

i) R^{-1} ii) R^2

Also draw digraph for R.

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

Q.9 a) Let R be the relation defined on Z by **(10)**

xRy iff $3x+4y$ is divisible by 7.

Show that R is an equivalence relation.

b) *Let A, B, C* be sets. Show that **(10)**

$\overline{A\cup(B\cap C)}=(\overline{C}\cup\overline{B})\cap\overline{A}$

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