

S.D.E.
M.C.A. Sem – I (CBCS - 2018 Course) : SUMMER - 2019
SUBJECT : DISCRETE STRUCTURES

Day : Thursday
Date : 09/05/2019

S-2019-5243

Time : 10.00 AM TO 1.00 PM
Max. Marks : 70

N.B.:

- 1) Attempt **ANY FOUR** questions from Section – I and **ANY TWO** questions from Section – II.
- 2) Answers to both the sections should be written in **SAME** answer book.
- 3) Figures to the right indicate **FULL** marks.

SECTION – I

- Q.1** a) Show that $P \rightarrow Q \equiv \sim P \vee Q$. [05]
b) Obtain the CNF of $P \rightarrow (P \wedge (Q \rightarrow P))$. [05]
- Q.2** a) Prove the following: $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$. [05]
b) A and B be two fuzzy sets defined on a set $x = \{10, 15, 20, 25, 30, 40\}$ whose membership functions defined as follows: [05]
$$\mu_A(x) = \frac{x-10}{30} \quad \text{and} \quad \mu_B(x) = \frac{x}{40}$$
. Find $A \cup B, A \cap B, \bar{A}$ and \bar{B} .
- Q.3** a) Find the values of q and r for $a = bq + r$ and $0 \leq r < |b|$. $a = 107, b = -3$. [05]
b) Find the remainder when 3^{28} is divided by 5. [05]
- Q.4** Let $f(x) = x + 3, g(x) = x - y$ and $h(x) = 2x$. Find $f \circ g(x), g \circ h(x), h \circ f(x), g \circ f(x),$ [10]
 $f \circ g \circ h(x)$.
- Q.5** a) In how many ways can 5 students be arranged in a row from a set of 8 students, [05]
if 2 particular students always take the corner seat?
b) Use mathematical induction prove that for every non-negative integer [05]
 $1 + 2 + 2^2 + \dots + 2^n = 2^{n+1} - 1$.
- Q.6** Write short notes on **ANY TWO** of the following: [10]
a) Grammar
b) Modus ponens and modus tollens
c) Half Adder and Full Adder

SECTION – II

- Q.7** a) Let $R = \{(1, 3), (2, 5), (4, 7)\}$ be a relation on a set $A = \{1, 2, 3, 4, 5, 6, 7\}$. [07]
Find R^{-1} .
b) Solve the following recurrence relation $a_r = 2a_{r-1} + 1$ for $r \geq 2, a_1 = 1$. [08]
- Q.8** Define the Hasse diagram of $\{(2, 3, 4, 9, 12, 18, 36), |\}\}$. Find the least element, [15]
greatest element, maximal element, minimal element, lower bounds, upper
bounds, glb and lub of the following sets:
i) $A_1 = \{12, 18\}$ ii) $A_2 = \{4, 9\}$ iii) $A_3 = \{2, 3, 12, 18\}$.
- Q.9** a) $L_1 = \{a, ab\}, L_2 = \{a, b\}$. Find the following: i) $L_1 \cdot L_2$ ii) L_1^* iii) L_2^* . [07]
b) Define Equivalence relation with example. [08]

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