D 13245 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2021

M.C.A.

MCA 20 103—DISCRETE MATHEMATICAL STRUCTURES

(2020 Syllabus Year)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. (A) Use principle of inclusion or exclusion to solve the following :

In a conference held in Mumbai, 500 delegates attended it. 200 of them would take tea, 350 would take coffee and 10 did not take either tea or coffee.

i) How many can take both tea and coffee ?

ii) How many can take tea only ?

iii) How many can take coffee only ?

(10 marks)

(B) Let f and g be the functions from the set of integers to the set of integers defined by $f(x) = 2x + 3$ and $g(x) = 3x + 2$. What is the composition of f and g ? What is the composition of g and f ?

(10 marks)

2. (A) What is a simple proposition and compound proposition ? Explain with example. (10 marks)

(B) Show that the compound statements $(\sim P \wedge (\sim Q \wedge R) \vee (Q \wedge R) \vee (P \wedge R))$ and R are equivalent.

(5 marks)

(C) Construct the truth table for $(p \rightarrow q) \wedge (q \rightarrow p)$.

(5 marks)

Turn over

3. (A) Show that in a lattice if $a \leq b \leq c$ then $a \oplus b = b * c$ and $(a * b) \oplus (b * c) = b = (a \oplus b) * (a \oplus c)$. (10 marks)

(B) Determine whether the posets $(\{1, 2, 3, 4, 5\}, |)$ and $(\{1, 2, 4, 8, 16\}, |)$ are lattices. (5 marks)

(C) Explain the properties of lattices. (5 marks)

4. (A) Determine whether $(z, +, .)$ is a ring with binary operation. (10 marks)

(B) Define : i) Isomorphism ; ii) Homomorphism ; and iii) Automorphism. (10 marks)

5. Explain the following with examples :

(A) Regular Graph ; (B) Bipartite Graph ; (C) Isomorphism of graphs ; and (D) Hamiltonian Graph. (4 × 5 = 20 marks)

6. (A) Show that $\sim (P \rightleftarrows Q)$ and $(\sim P \rightleftarrows Q)$ are logically equivalent. (10 marks)

(B) A = {2, 3, 4}, B = {1, 2} find A + B , B + C, A + B + C. (10 marks)

7. (A) Obtain PCNF and PDNF of $(P \rightarrow (Q \wedge R)) \wedge (\sim P \rightarrow (\sim Q \wedge \sim R))$. (10 marks)

(B) Draw a graph with the adjacency matrix $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$. (5 marks)

(C) Determine whether the posets $(\{1,2, 3, 4, 5\}, |)$ and $(\{1,2, 4, 8, 16\}, |)$ are lattices. (5 marks)