

**II B. TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, FEB - 2022**  
**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**  
**(Common CSE and INF)**

Time : 3 Hours

Max. Marks : 60

**Note : Answer ONE question from each unit (5 × 12 = 60 Marks)**

UNIT-I

1. a) Define Principle conjunctive normal form. Find the PCNF of [6M]  
 $[P \rightarrow (Q \wedge P)] \wedge [\sim P \rightarrow (\sim Q \wedge \sim R)]$  With out construction of the truth table.
- b) Define the Tautology. Show that for any position p,q,r the [6M]  
 compound proposition  $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$  is a Tautology.

(OR)

2. a) Find whether the following arguments is valid (or) not: [6M]  
 If a triangle has two equal sides then it is isosceles.  
 If a triangle is isosceles then it has two equal angles.  
 A certain triangle ABC does not have two equal angles.  
 Therefore, triangle ABC does not have two equal sides.
- b) Check whether the following are logically equivalent or not. [6M]  
 $\{(P \rightarrow Q) \wedge [\sim Q \wedge (R \wedge \sim Q)]\} \Leftrightarrow \sim (Q \vee P)$ .

UNIT-II

3. a) Let  $A = \{1, 2, 3, 4, 5\}$  define a relation on  $A \times A$  by  $(x_1, y_1) R (x_2, y_2)$  if and [6M]  
 only if  $x_1 * y_1 = x_2 * y_2$  verify that R is an equivalence relation on A
- b) Let  $A = \{1, 2, 3, 4\}$  and R be a relation on defined by  $x R y$  if and only [6M]  
 if "x divides y" written  $x/y$ . Write down R as a set of order pairs.  
 Draw the digraph of R and determine in degree and out degree  
 of the vertices of the digraph.

(OR)

4. a) Let  $f, g, h$  be the functions from Z to Z defined by [6M]  
 $f(x) = x - 1, g(x) = 3x, h(x) = \begin{cases} 0 & \text{if } x \text{ is even} \\ 1 & \text{if } x \text{ is odd} \end{cases}$

Determine

(i)  $f \circ (g \circ h)(x)$  (ii)  $(f \circ g) \circ h(x)$  (iii) verify that  $f \circ (g \circ h) = (f \circ g) \circ h$

- b) Let  $R = \{(1,1), (1,2), (1,3), (1,4), (2,4), (2,2), (2,3), (4,4)\}$  be a relation [6M]  
 verify that R is a partial ordering relation (or) not if Yes draw the  
 Hasse diagram for it.

## UNIT-III

5. a) Prove that a group consisting of three elements is an abelian group? [6M]  
 b) Prove that  $G = \{1, -1, i, -i\}$  is an abelian group under multiplication. [6M]

(OR)

6. a) Explain briefly about Fermat's theorem? [6M]  
 b) Let  $G$  be a set of all rational numbers and  $a * b = a + b - ab$  show that  $(G, *)$  is an abelian group. [6M]

## UNIT-IV

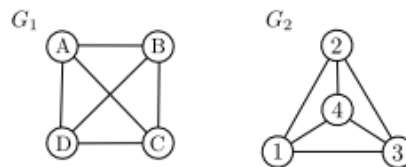
7. a) Find the coefficient of  $x^7$  in the expansion of  $(1 + x^5 + x^7)^{20}$  [6M]  
 b) Use the generating function to solve the recurrence relation  $a_n = 3a_{n-1} + 2$  with the initial condition  $a_0 = 1$  [6M]

(OR)

8. a) Consider an equilateral triangle whose sides are of length 3 units. If ten points are chosen lying on (or) inside the triangle then show that at least two of, them are no more than 1 unit apart. [6M]  
 b) Solve the recurrence relation  $a_n = 5a_{n-1} - 6a_{n-2}$  where  $a_0 = 4$  and  $a_1 = 7$  [6M]

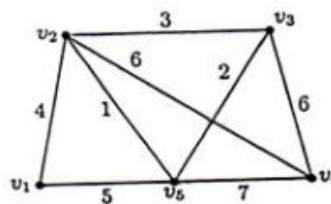
## UNIT-V

9. a) Define the isomorphism of two graphs? Explain the procedure for isomorphism between two graphs? [6M]  
 b) Verify the two graphs are isomorphic (or) not? [6M]



(OR)

10. a) Explain the procedure of Prim's algorithm for finding the minimal spanning tree? [6M]  
 b) Find the minimal spanning tree from the given graph by using Prim's algorithm [6M]



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