

--	--	--	--	--	--	--	--	--	--



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech III Semester End Examinations (Regular) - December, 2017

Regulation: IARE – R16

## DISCRETE MATHEMATICAL STRUCTURES

(Common for CSE | IT)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

### UNIT – I

1. (a) List and explain the Well-formed Formulas and Equivalent Formulas. [6M]
- (b) Verify the following logical equivalences using truth tables [8M]
  - i.  $[(P \vee Q) \rightarrow R] \Leftrightarrow [(P \rightarrow R) \wedge (Q \rightarrow R)]$
  - ii.  $[P \rightarrow (Q \vee R)] \Leftrightarrow [\neg R \rightarrow (P \rightarrow Q)]$
2. (a) Verify the validity of the following argument. Tigers are dangerous animals. There are Tigers. Therefore there are dangerous animals. [7M]
- (b) Show that  $R \rightarrow S$  is a valid conclusion from the premises  $P \rightarrow (Q \rightarrow S)$ ,  $\neg R \vee P$  and  $Q$ . [7M]

### UNIT – II

3. (a) Define the following and give suitable examples for each [6M]
  - i. Lattice
  - ii. Sub lattice
  - iii. Distributive lattice
  - iv. Complemented lattice
- (b) Let  $A$  be the given finite set and  $\rho(A)$  is its power set. Let  $\subseteq$  be the inclusion relation on the elements of  $\rho(A)$ . Draw the Hasse diagrams of  $(\rho(A), \subseteq)$  for [8M]
  - i.  $A = \{a\}$
  - ii.  $A = \{a, b\}$
  - iii.  $A = \{a, b, c\}$
  - iv.  $A = \{a, b, c, d\}$
4. (a) Let  $n$  be a positive integer and  $S_n$  be the set of all divisors of  $n$ . Let  $D$  denote the relation of “division”. Draw the diagrams of lattices  $(S_n, D)$  for  $n = 6, 8, 24$  and  $30$ . [7M]
- (b) Consider  $f(x) = x+2$ ,  $g(x) = x-2$  and  $h(x) = 3x$  for  $x \in \mathbb{R}$ , where  $\mathbb{R}$  is the set of real numbers. Find  $\text{gof}(x)$ ,  $\text{fog}(x)$ ,  $\text{fof}(x)$ ,  $\text{gog}(x)$ ,  $\text{foh}(x)$ ,  $\text{hof}(x)$  and  $\text{fohog}(x)$ . [7M]

**UNIT – III**

5. (a) Define Monoid and prove that identity element in a monoid is unique. [7M]  
 (b) Prove the Pascal's identity  $C(n, r) = C(n-1, r) + C(n-1, r-1)$ . [7M]
6. (a) Find the term containing  $x^8$  in the expansion of  $(x^2 - \frac{2}{x^2})^8$ . [7M]  
 (b) Determine the number of non negative integral solutions of the equation  $x_1 + x_2 + x_3 + x_4 + x_5 = 18$  where each  $x_i \geq 2$ . [7M]

**UNIT – IV**

7. (a) Solve the recurrence relation using generating functions  $a_n - 7a_{n-1} + 10a_{n-2} = 0$  where  $a_0 = 10, a_1 = 41$  [7M]  
 (b) Find the solution of the recurrence relation using characteristic roots  $a_n - 5a_{n-1} + 6a_{n-2} = 0$  where  $a_0 = 2, a_1 = 5$  [7M]
8. (a) Find the solution of  $a_n - 4a_{n-1} - 12a_{n-2} = 0, n \geq 2, a_0 = 4; a_1 = \frac{16}{3}$  by the method of Characteristic roots. [7M]  
 (b) Find the coefficient of  $x^{18}$  in the product  $(x + x^2 + x^3 + x^4 + x^5)(x^2 + x^3 + \dots)^5$ . [7M]

**UNIT – V**

9. (a) Define the following and provide suitable example for each [7M]  
 i. Isomorphic graph  
 ii. Euler graph  
 iii. Hamiltonian Graph  
 iv. Planar Graph  
 (b) Find a minimal spanning tree for the graph shown in Figure 1. [7M]

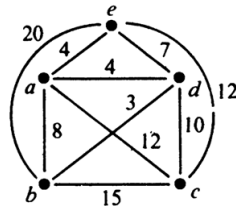


Figure 1

10. (a) Define [7M]  
 i. Complete graph  
 ii. Bipartite graph with an example for each

(b) Is the following pair of graphs shown in Figure 2 isomorphic? Justify your answer

[7M]

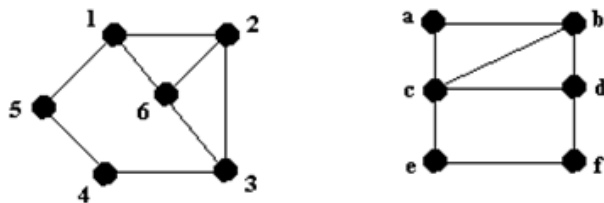


Figure 2

— o o ○ o o —