

**ANURAG Engineering College**

(An Autonomous Institution)

II B.Tech I Semester Supplementary Examinations, December – 2024

**DISCRETE MATHEMATICAL STRUCTURES****(COMPUTER SCIENCE AND ENGINEERING)****Time: 3 Hours****Max. Marks: 75****Section – A (Short Answer type questions)****(25 Marks)****Answer All Questions**

	Course Outcome	B.T Level	Marks
1. Define i. Rule of syllogism ii. Rule of detachment	CO1	L1	2M
2. Let $A = \{1,2,3,4\}$ , then write all possible subsets of A	CO1	L2	3M
3. Obtain principal conjunctive normal form (PCNF) for the formula $(\sim p \rightarrow r) \wedge (q \leftrightarrow p)$	CO2	L2	2M
4. Construct the truth tables of the following compound proposition $(p \wedge q) \rightarrow r$	CO2	L2	3M
5. Write the characteristic roots equation for $an^3+3an-1+4an-2-8an^3=0, n \geq 3$	CO3	L2	2M
6. Explain generating function and give the generating function for the sequence 12, 22, 32, ...	CO3	L2	3M
7. Define what is a group?	CO4	L1	2M
8. Define a lattice. Explain its properties	CO4	L2	3M
9. What is a spanning tree? Give an example	CO5	L1	2M
10. Explain about Graph colouring?	CO5	L2	3M

**Section B (Essay Questions)****Answer all questions, each question carries equal marks.****(5 X 10M = 50M)**

11. A) Let  $X = \{1,2,3\}$  and  $f, g, h$  and  $s$  be functions from  $X$  to  $X$  given by  $f = \{(1,2), (2,3), (3,1)\}$ ,  $g = \{(1,2), (2,1), (3,3)\}$ ,  $h = \{(1,1), (2,2), (3,1)\}$ . Find  $f \circ g$ ,  $f \circ h \circ g$ .
- OR**
- B) Suppose a list A contains 30 students in a mathematics class, and a list B contains 35 students in an English class and suppose there are 20 names on both the lists. Find the number of students: (i) Only on list A (ii) only on list B (iii) on list A or B (or both) (iv) on exactly one list
12. A) What are universal and existential quantifiers. Symbolize the following argument and check for its validity:  
All Lions are dangerous animals.  
There are Lions.  
Therefore, there are dangerous animals
- OR**
- B) Show that the following premises are inconsistent  $P \rightarrow Q, R \rightarrow S, P \vee R, \sim(Q \vee S)$

13. A) Solve the recurrence relation  $a_n = 2a_{n-1} + 3a_{n-2}$  for  $n \geq 2$  where  $a_0 = 2$  and  $a_1 = 2$ . CO3 L2 10M
- OR**
- B) Using generating function find an in terms of n if  $a_0 = 1$ ,  $a_1 = 2$ , and  $a_{n+2} = 5a_{n+1} - 4a_n$  for  $n \geq 0$ . CO3 L3 10M
14. A) Draw the adjacency matrix of the relation  $\leq$  on the set  $(0,1,2,3,4)$ . Is this matrix reflexive? Explain. And also draw the graph. CO4 L3 10M
- OR**
- B) Show that the relation  $\subseteq$  defined on the power set  $P(B)$  of the set  $B$  is a partial order relation. For the set  $B = \{a,b,c\}$  and  $X = P(B)$ , draw the Hasse diagram for the poset  $(X, \subseteq)$ . CO4 L3 10M
15. A) A Connected planar graph has 9 vertices having degrees 2,2,2,2,3,3,3,4,4,5. How many edges are there? How many faces are there? CO5 L3 10M
- OR**
- B) i) Prove that a complete graph  $K_n$  is planar if and only if  $n \leq 4$ . CO5 L3 5M  
ii) Prove that a tree with n vertices has  $(n - 1)$  edges 5M