

**II B. Tech I Semester Supplementary Examinations, September - 2021**  
**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**  
 (Computer Science & Engineering)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit  
 All Questions carry **Equal** Marks

- 1 a) Prove that  $[(P \wedge \neg Q) \rightarrow R] \rightarrow [P \rightarrow (Q \vee R)]$  is a tautology using a truth table. [8M]  
 b) Explain the law of duality with a case study. [7M]

Or

- 2 a) Define free and bound variables and explain the theory of predicate calculus. [8M]  
 b) Show that  $(\exists x)[F(x) \wedge S(x)] \rightarrow (y)[M(y) \rightarrow W(y)]$  and  $(\exists y)[M(y) \wedge \neg W(y)]$  derives the Conclusion,  $(x)[F(x) \rightarrow \neg S(x)]$ . [7M]
- 3 a) Find the transitive closure for the  $R = \{(1,2), (2,3), (3,4)\}$  on  $X = \{1,2,3,4\}$  [8M]  
 b) Demonstrate equivalence relation with a case study. [7M]

Or

- 4 a) Discuss the similarities and dissimilarities between monoid and group. [8M]  
 b) Draw the Hasse diagram for the relation  $\leq$  defined as  $x \leq y$ , if  $x$  divided  $y$  where  $X = \{2,3,6,12,24,36\}$  [7M]
- 5 a) State and Prove Fermat's theorem. [8M]  
 b) How many ten digit binary numbers can be formed with (i) exactly five 1's (ii) greater than five 1's. [7M]

Or

- 6 a) Discuss the properties of modular arithmetic with examples. [8M]  
 b) Explain the binomial theorem with an example. [7M]
- 7 a) Calculate the coefficient of  $X^{15}$  in  $A(X) = (X^2 + X^3 + X^4 + X^5)(X + X^2 + X^3 + X^4 + X^5 + X^6 + X^7)(1 + X + \dots + X^{15})$  [8M]  
 b) Solve the recurrence relation  $a_n - 9a_{n-1} + 26a_{n-2} - 24a_{n-3} = 0$  for  $n \geq 3$  using characteristic polynomial representation. [7M]

Or

- 8 a) Find the Coefficient of  $X^{23}$  and  $X^{32}$  in  $(1 + X^5 + X^9)^{10}$  [8M]  
 b) Discuss the importance of methods to solve a recurrence relation. [7M]
- 9 a) Trace the BFS algorithm with a case study. [8M]  
 b) Define a minimum spanning tree and write a procedure to identify a minimum spanning tree for an example graph. [7M]

Or

- 10 a) Discuss the similarities and dissimilarities between Eulerian and Hamiltonian graphs. [8M]  
 b) Define the following terms in graph theory (i) path (ii) cycle (iii) loop [7M]