

**R17****Code No: 841AA****JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****MCA I Semester Examinations, June/July - 2018****MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE****Time: 3hrs****Max.Marks:75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A**5 × 5 Marks = 25**

- 1.a) Construct the truth table for $(P \wedge Q) \rightarrow (P \vee Q)$. [5]
- b) Define complement of a function and inverse of a function. Give examples. [5]
- c) Find the coefficient of x^4y^7 in the expansion of $(x-y)^{11}$. [5]
- d) What is meant by generating function? What is its significance? [5]
- e) Find the minimum number of vertices in a simple, connected, planar graph with 19 edges. Justify your answer. [5]

PART - B**5 × 10 Marks = 50**

- 2.a) Using indirect method of proof, derive $P \rightarrow \neg S$ from $P \rightarrow Q \vee R$, $Q \rightarrow \neg P$, $S \rightarrow \neg R$, P . [5]
 - b) Contrast propositional logic with predicate logic. [5+5]
- OR**
3. Explain automatic theorem proving with the following expression

$$P, \neg P \vee (P \vee Q) \rightarrow Q$$
 [10]
 - 4.a) If $f: X \rightarrow Y$ and $g: Y \rightarrow X$ the function g is equal to f^{-1} only if $g \circ f = I_X$ and $f \circ g = I_Y$. Prove the result.
 - b) Let $f: \mathbb{R} \rightarrow \mathbb{R}$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ where \mathbb{R} is the set of real numbers. Find $f \circ g$ and $g \circ f$ where $f(x) = x^2 - 2$, $g(x) = x + 4$. State whether these functions are injective, surjective or bijective. [5+5]
- OR**
- 5.a) Let L a finite distributive lattice. Then prove that every element in L can be written uniquely (except for order) as the join of irredundant join-irreducible elements.
 - b) Prove the independent laws for the elements of a lattice. [5+5]
 6. Find the number of ways three roses, four marigolds and five hibiscuses can be planted:
 - a) In a row such that all plants of the same family is next to each other.
 - b) In a row such that the hibiscus are planted in between the other two families of plants. [5+5]
- OR**
- 7.a) Find the number of different arrangements of the letters of the word REFERENCE.
 - b) State inclusion-exclusion principle. [5+5]

8. Solve the recurrence relation $a_n - 7a_{n-1} + 26a_{n-2} - 24a_{n-3} = 0$ for $n \geq 2$. [10]

OR

9. Demonstrate the solutions for non-homogeneous recurrence relation. [10]

10.a) Prove that any two simple connected graphs with n vertices and all of degree two are isomorphic.

b) Suppose G_1 and G_2 are isomorphic prove that if G_1 is connected then G_2 is also connected. [5+5]

OR

11.a) State and explain the Four - Colour problem for planar graphs.

b) Prove that the regions of a planar graph can be 4 - coloured if G has a Hamiltonian cycle. [5+5]

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