# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD 



MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
Time: 3hrs
Max.Marks:60

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 8 marks and may have $\mathrm{a}, \mathrm{b}, \mathrm{c}$ as sub questions.

## PART - A

$$
5 \times 4 \text { Marks }=20
$$

1.a) What do you mean by tautological implication? Give an example.
b) Explain transitive closure property.
c) Write about binomial and multinomial theorems.
d) What are generating functions? Give an example.
e) Write about binary trees.

## PART - B

$$
5 \times 8 \text { Marks }=40
$$

2.a) Express $\mathrm{P} \rightarrow(\neg \mathrm{P} \rightarrow \mathrm{Q})$ in terms of $\uparrow$ only.
b) Define Universe of Discourse? Symbolize the given statement with and without using the set of positive numbers as the Universe of Discourse. Statement: "Given any positive integer there is a greater positive integer."
[4+4]

## OR

3. Give an over view of theory of inference for predictive calculus.
4. $S=\{1,2,3,4\}$ and $A=S \times S$. Define a relation $R$ on $A$ by
$(a, b) R\left(a^{\prime}, b^{\prime}\right) \Leftrightarrow a+b=a^{\prime}+b^{\prime}$.
a) Show that $R$ is an equivalence relation.
b) Compute $A / R$.
[4+4]

## OR

5.a) Let ( $\mathrm{S},{ }^{*}$ ) and ( $\mathrm{T},{ }^{*}$ ) be Semi Groups. Show that the function $\mathrm{f}: \mathrm{S} \times \mathrm{T} \rightarrow \mathrm{S}$ defined by $f(s, t)=s$ is a Homomorphism of the Semi Group $S \times T$ onto the Semi Group S?
b) Give an over view of lattice as an algebraic structures.
6.a) Explain pigeon hole principles and its applications.
b) Explain the principles of inclusion and exclusion.

## OR

7. Determine the coefficients of $x^{2} y^{3}$ and $x^{3} y^{2}$ in $(2 x+3 y)^{10}$.
8. What are characteristic roots? Explain how characteristics roots can be used in solving recurrence relation using examples.

## OR

9. Write short notes on how each of the following can be used in solving recurrence relation.
a) Function of sequences
b) Coefficients of generating functions.
10. Explain the following with examples:
a) Hamiltonian Graphs
b) Planar graphs and multi -graphs.

OR
11. Write Kruskal's Algorithm and explain. Find the minimum cost spanning tree for the given graph? And calculate its minimum cost.
[8]


