R15

Code No: 123BN

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December - 2016
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Common to CSE, IT)

Time: 3 Hours **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 **(25 Marks)**

1.a) Give the truth table for the propositional formula
$(P \leftrightarrow \sim Q) \rightarrow (P \wedge Q)$ [2]
b) Write the sentence "It is not true that all roads lead to Rome" in the symbolic form. [3]
c) Define lattice. [2]
d) What is a monoid? [3]
e) How many words of three distinct letters can be formed from CAKE? [2]
f) Give the disjunctive rule for counting problem. [3]
g) What is the closed form expression of the sequence $a_n = 9.5^n, n \geq 0$? [2]
h) Find the coefficient of x^9 in $(1 + x^3 + x^8)^{10}$ [3]
i) What are the advantages of adjacency matrix representation? [2]
j) Define a spanning tree. [3]

PART - B **(50 Marks)**

2.a) Obtain the principal disjunctive normal form of the following formula
$P \vee (\neg P \rightarrow (Q \vee (\neg Q \rightarrow R)))$
b) Verify whether the proposition $((P \vee \neg q) \rightarrow r) \leftrightarrow s \vee \neg(((P \vee \neg q) \rightarrow r) \leftrightarrow s)$. [5+5]

OR

3.a) Show that $(\forall x)(p(x) \wedge Q(x)) \rightleftarrows ((\forall x)(p(x) \wedge (\forall x)(Q(x))$ is a logically valid statement.
b) Show the following using the automatic theorem.
i) $P \Rightarrow (\neg P \rightarrow Q)$ ii) $P \wedge \neg P \wedge Q \Rightarrow R$ [5+5]

4.a) Show that the functions $f : R \rightarrow (1, \infty)$ and $g : (1, \infty) \rightarrow R$ defined by $f(x) = 3^{2x} + 1$, $g(x) = \frac{1}{2}\log_3(x-1)$ are inverses.
b) Prove that the transitive closure R^+ of a relation R on a set A is the smallest transitive relation on A containing R. [5+5]

OR

5.a) Let G is a group, $a \in G$. If O(a)=n and m/n then prove that $O(a^m) = \frac{n}{m}$.
b) Let S is a semi group. If for all $x, y \in s$, $x^2 y = y x^2$ prove that S is an abelian group. [5+5]

6.a) How many ways are there to distribute 12 different books among 15 people if no person is to receive more than one book?
b) How many different outcomes are possible from tossing 12 similar dice? [5+5]

OR

7.a) Find the mid-term of $\left(2x - \frac{1}{3x}\right)^{10}$.
b) Find the term which contains x^{11} and y^4 in the expansion of $(2x^3 + 3xy^2 + z^2)^6$. [5+5]

8.a) Solve $a_{n+2} - 6a_{n+1} + 9a_n = 3.2^n + 7.3^n$ for $n \geq 0$ Where $a_0 = 1,\ a_1 = 4$.
b) Solve the following recurrence relation by substitution
$a_n = a_{n-1} + 3n^2 + 3n + 1$ Where $a_0 = 1$. [5+5]

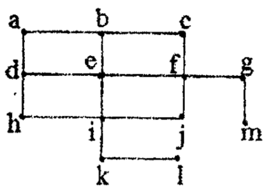
OR

9.a) Solve the recurrence relation $a_{n+2}^2 - 5a_{n+1}^2 + 6a_n^2 = 7n$ for $n \leq 0$, given $a_0 = a_1$.
b) Find a general expression for a_n using generating functions
$a_n - 7a_{n-1} + 16a_{n-2} - 12a_{n-3} = 0,\ n \geq 3$ [5+5]

10.a) Let G be the non directed graph of order 9 such that each vertex has degree 5 or 6. Prove that atleast 5 vertices have degree 6 or atleast 6 vertices have degree 5.
b) Determine the number of edges in:
i) K_n ii) $K_{m,n}$ iii) P_n. [5+5]

OR

11.a) Using depth first search method, determine the spanning tree T for the following graph with e as the root of T.



b) Give an example graph which is Hamiltonian but not Eulerian. [5+5]

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