Code No:811AA

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
MCA I Semester Examinations, April/May - 2019
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 a, b, c as sub questions.

PART - A

5 × 4 Marks = 20

1.a) Give the converse, contrapositive and inverse of the following statement:
The hut will destroy if there is a cyclone. [4]
b) Define the terms: Equivalence relation, Partially ordered relation and Totally ordered relation. Give examples for each. [4]
c) How many integers between 1 and 1000 inclusive have the sum of the digits equal to 7. [4]
d) Solve the recurrence relation $a_n = na_{n-1}$ for $n \geq 1$, given that $a_0 = 1$. [4]
e) What is a Hamiltonian graph? Discuss briefly. [4]

PART - B

5 × 8 Marks = 40

2.a) Show that (P→S) can be derived from the premises $\neg P \vee Q$, $\neg Q \vee R$, $R \rightarrow S$ using CP rule.
b) Obtain the PCNF of the $(P \rightarrow (Q \wedge R)) \wedge (\neg P \rightarrow (\neg Q \wedge \neg R))$. [4+4]

OR

3.a) Show that $(x)(p(x) \vee Q(x)) \Rightarrow (x)\, p(x) \vee \exists(x)\, Q(x)$.
b) Use truth tables to establish whether the following statement forms a tautology or a contradiction or neither. $P \rightarrow (Q \rightarrow R)$. [4+4]

4. Define equivalence classes. Let Z be the set of integers and Let R be the relation called "congruence modulo 3" defined by $R = \{\langle x,y \rangle \ / \ x \in Z \wedge y \in Z \wedge (x-y)$ is divisible by $3\}$. Determine the equivalence classes generated by the elements of Z. [8]

OR

5.a) Draw the Hasse diagram for the Poset. $\langle\{2,4,5,10,12,20,25\}, / \rangle$.
b) Let R = { (b,c), (b,e), (c,e), (d,a), (c,b), (e,c)} be a relation on the set A = {a,b,c,d,e}. Find the transitive closure of the relation R. [4+4]

6.a) What is the coefficient of x^2y^5 in $(2x-9y)^{10}$?
b) How many 6 digit numbers without repetition of digits are there such that the digits are all non-zero and 1 and 2 do not appear consequently in either order? [4+4]

OR

7. State and explain Multinomial theorem with an example illustration. [8]

8. Solve the recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 0$ where $a_0=1$ and $a_1 = 6$. [8]

OR

9. Using generating function, solve the $y_{n+2} - 4y_{n+1} + 3yn = 0$, given $y_0 = 2$, $y_1 = 4$. [8]

10. Explain prim's algorithms with suitable example. [8]

OR

11. State Graph coloring problem and describe its importance in computations. [8]

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