Code: 19A54303 **R19**

B.Tech II Year I Semester (R19) Regular Examinations March 2021

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(Common to CSE & IT)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Prove that (P ∨ Q)∨ ¬ P is a tautology.

(b) Demonstrate that R is a valid inference from the premises P→Q, Q→R and P.

(c) If $f(x) = x^2 - 6 = y$, then find $f^{-1}(y)$.

(d) Let $A = \{a, b, c\}$. Draw the Hasse diagram for $(P(A), \subseteq)$ where P(A) is the power set of A.

(e) State sum rule and product rule of counting.

(f) In how many ways can 5 children arrange themselves in a ring?

(g) Find a recurrence relation for the number of ways to make a pile of n chips using garnet, gold, red, white, and blue chips such that no two gold chips are together.

(h) Solve the following recurrence relation using generating functions:

$a_n - 6a_{n-1} = 0$ for n>=1 and $a_0 = 1$.

(i) A complete binary tree has 125 edges. How many vertices does it have?

(j) What is chromatic number? Give an example.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Obtain PDNF and PCNF of the following formula:

P ∨(¬ P → (Q ∨ (¬ Q → R)))

OR

3 (a) Verify the validity of the following:

All men are smokers. There are men. Therefore, there are smokers.

(b) Prove that (P→Q) ∧ (Q →R) ⇒ (P→R).

UNIT – II

4 (a) Let A = {a,b} & R = {(a,b)(b,a)(b,b)} S = {(a,a)(b,a)(b,b)} be relations in A. Find R.S and S.R. Comment on the result.

(b) Draw the Hasse diagram for the divisibility relation on the set {1, 2, 3, 4, 8, 16, 28, 32, 64}.

OR

5 (a) Let A = {1, 2, 3, 4} and P = {{1}, {2, 3}, {4}} be a partition of A. Find an equivalence relation on A whose equivalence classes are precisely members of P.

(b) Show that the necessary and sufficient condition for a non empty subset H of a group G to be a sub group is $a \epsilon H, b \epsilon H \Rightarrow a * b^{-1} \epsilon H$.

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UNIT – III

6 (a) In how many ways can you select at least one king, if you choose five cards from a Deck of 52 cards?

(b) 15 males and 10 females are seated in a round table meeting. How many ways they can be seated if all the females are to be seated together?

OR

7 (a) Define binomial theorem? What is the coefficient of $x^{101}y^{99}$ in the expansion of $(2x-3y)^{200}$?

(b) In how many ways can the letters {4.a, 3.b, 2.c} be arranged so that all the letters of the same kind are not in a single block?

UNIT – IV

8 (a) Solve the recurrence relation $a_n + 7a_{n-1} + 8a_{n-2} = 0$ where $a_0 = 1$, $a_1 = -2$.

(b) Solve the recurrence relation of Fibonacci series.

OR

9 (a) Explain how recurrence relations can be solved by the method of characteristic roots.

(b) Solve the following recurrence relation:

$S_n = 4S_{n-1} + 12n$ where $S_0 = 6$ and $S_1 = 7$.

UNIT – V

10 (a) Explain isomorphism of two graphs with suitable example.

(b) Draw all distinct binary tress with 3 vertices and 4 vertices.

OR

11 (a) Explain Kruskal's algorithm to find minimal spanning tree of the graph with suitable example.

(b) Show that in every graph the number of vertices of odd degrees is even.

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