R15

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, April/May - 2023
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Common to CSE, IT)

Time: 3 hours   **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART - A

(25 Marks)

1.a) Write negation for the statements "If laptop is not working properly then Dr. Kumar can't take the class". [2]

b) Consider the statements:
Statement1: if 2+2=4 then Sun rises in the east
Statement 2: $2+2 \neq 4$ or Sun rises in the east
Is the statement1 and statement2 are logically equivalent? Justify your answer. [3]

c) Let R = {(1,2),(2,3),(3,2),(2,1)} on set X = {1,2,3}. Find transitive closure of R. [2]

d) Represent the relation R = {(1,1),(2,2),(3,3),(2,3),(3,1),(1,3)} on the set X={1,2,3} in matrix form and graph form [3]

e) How many can 10-similar coins fall, heads when they tossed simultaneously? [2]

f) How many 3-digit even numbers are possible with digits 1,3,5,6,7,8? [3]

g) Develop the generating function for the sequence 1,1,1,1,2,2,2,3,3,4. [2]

h) Find the co-efficient of X^{14} in $(1 + X + X^2 + X^3)^{10}$. [3]

i) Define planar graph. Is $K_{2,3}$ planar graph? [2]

j) A connected planar graph contains 5 vertices and 5 edges. How many regions will be there? [3]

PART - B

(50 Marks)

2.a) Construct truth table for the propositional function $(P \rightarrow \sim Q) \wedge (Q \vee R)$ and verify whether it is tautology, contradiction or contingency

b) Using Automatic Theorem proving show that $\sim(P \vee Q)$ is logically equivalent to $\sim P \wedge \sim Q$. [5+5]

OR

3. Verify that the following statements are consistent or not, using the rules of inference.
Statement 1: If Jack misses many classes through illness, then he fails high school
Statement 2: If Jack fails high school, then he is uneducated
Statement 3: If Jack reads a lot of books, then he is not uneducated
Statement 4: Jack misses many classes through illness and reads a lot of books. [10]

4.a) Let A = {1,2,3} , Let P(A) represents power set of A . Draw the Hasse diagram for the Poset (P(A), subset or equal to).

b) Consider the sets $A = \{1,2,3,4\}$, $B=\{3,4,5,6,7\}$, $C =\{6,7,8,9\}$
Find $AUBUC$, $(A∩B) – (B∩C)$, $A – (BUC)$, AXB(where X is Cartesian product). [5+5]

OR

5.a) Consider the relation $R=\{(2,2),(2,3),(2,4),(3,2),(3,3),(3,4)\}$ on set X = {2,3,4}. What are the properties that are satisfied by the relation R. Justify your answer.

b) Consider the set $X = \{ 2,3,6,8,12 \}$, a relation R is defined as $R =\{(a,b)$ | **a divides b, for a,b belongs to X}** . Is R a partial ordered relation or not? Justify your answer. Represent R in Graph and matrix form. [5+5]

6.a) Find the number of integral solutions to $x_1+x_2+x_3+x_4 =50$, where $x_1 \geq -4$, $x_2 \geq 7$, $x_3 \geq -14$, $x_4 \geq 10$.

b) Enumerate 3- combinations and 3-permutations of {1.a , 3.b, 2.c,1.d}. [5+5]

OR

7. Suppose that the license plates of a certain state require 3 English letters followed by 4 digits.
a) How many different plates can be manufactured if repetition of letters and digits are allowed?
b) How many plates are possible if only the letters can be repeated?
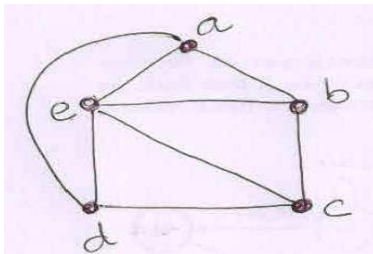c) How many are possible if only the digits can be repeated? [10]

8. Solve the following In homogenous recurrence relation:
$a_n - 9 a_{n-1} + 20 a_{n-2} = 2^n$, for n $\geq$ 2 and $a_0 = -3$ and $a_1 = -10$ [10]

OR

9. Solve the following linear recurrence relation: $a_n - 3 a_{n-1} - 4 a_{n-2} = n-2$ for n $\geq$ 2, $a_0 = 1$ and $a_1 = 1$. [10]

10. What is Chromatic number? Apply an algorithm to find Chromatic number of the following graph. [10]

OR

11. Apply Krushkal's algorithm and Prim's algorithm to obtain minimal spanning tree and also find minimal cost. [10]

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