**Code No: 183AR** **R22**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B. Tech II Year I Semester Examinations, February - 2024**
**DISCRETE MATHEMATICS**
**(Computer Science and Engineering - IOT)**

**Time: 3 Hours** **Max. Marks: 60**

**Note:** This question paper contains two parts A and B.
i) **Part- A** for 10 marks, ii) **Part - B** for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of **ten questions** (numbered from 2 to 11) **carrying 10 marks each**. From each unit, there are two questions and the student should answer one of them. Hence, the student should answer five questions from Part-B.

## PART- A

**(10 Marks)**

1.a) Write the following statement in symbolic form: "the crop will be destroyed if there is a flood". [1]

b) Write the following statement in symbolic form: All the first year students know C Programming. Manisha is a first year student. [1]

c) Define power set. [1]

d) Prove that $A-(A-B)=A\cap B$. [1]

e) State modular lattice. [1]

f) State monoid homomorphism. [1]

g) How many ways can we draw a club and a diamond from a pack of cards? [1]

h) Find the number of non-negative integral solutions to $n_1+n_2+n_3+n_4=20$. [1]

i) Does there exist an Eulerian graph with an even number of vertices and an odd number of edges. [1]

j) Show that a simple connected planar graph with 17 edges and 10 vertices cannot be colored with 2-colors. [1]

## PART-B

**(50 Marks)**

2.a) Construct truth table for the following $p\rightarrow(\sim q\vee r)$.

b) Show that $\sim P$ is a valid inference from the premises $\sim(P\wedge\sim Q),\ \sim Q\vee R,\ \sim R$. [5+5]

**OR**

3. Obtain PCNF and PDNF for the following formula
$\{p\rightarrow(q\wedge r)\}\wedge\{\sim p\rightarrow(\sim q\wedge\sim r)\}$. [10]

4. a) Show that $\left(A\cap\left(B\cup\bar{A}\right)\right)\cup B=B$

b) If $A=\{1,3,5,7,8,9\}, B=\{3,5,8\}$, then verify that
$(A-B)\cup(B-A)=(A\cup B)-(A\cap B)$. [5+5]

**OR**

5. Let $f(x) = x+2$, $g(x) = x-2$, and $h(x) = 3x$ for $x \in \mathbb{R}$, where $\mathbb{R}$ is the set of real numbers. Find $gof$, $fog$, $hog$, $fo(goh)$, $(fog)oh$. [10]

6.a) Construct an **OR** gate using three **NAND** gates.

b) Describe a gating network corresponding to the statement $(x.y)+(y.z)+(z.x)$. [5+5]

**OR**

7.a) Prove that $(P(S), U)$ is a monoid.

b) If $B = D(24)$ be a Lattice, then find all the sublattices of $D(24)$. Also, draw the Hasse diagram. [5+5]

8.a) Find the $10^{th}$ term of $\left(2x^2 + \frac{1}{x}\right)^{12}$.

b) Show that $C(n-r) = C(n-1, r-1) + C(n-1, r)$. [5+5]

**OR**

9. a) Determine the co-efficient of $x^5 y^{10} z^5 w^5$ is the expansion of $(x-7y+3z-w)^{20}$.

b) Prove that $C(n,1) + C(n,3) + ..... = C(n,0) + C(n,2) + ..... = 2^{n-1}$. [5+5]

10.a) State and prove fundamental theorem of graph theory.

b) Let $T$ be a tree with $\alpha$ vertices of degree 1 and $\beta$ other vertices. Show that the sum of the degrees of the vertices of degree greater than 1 is $\alpha + 2(\beta - 1)$. [5+5]

**OR**

11.a) Determine the maximum number of edges in a simple graph with $n$ vertices and $k$ components.

b) State and Prove Euler's theorem for planar graphs. [5+5]

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