5. Attempt any two parts of the following : 5×2=10

(a) Simplify the Boolean expression :

$$A(A + B)(A + AB)$$

(b) Show that :

$(\sim p \wedge (p \vee q)) \Rightarrow q$ is a tautology.

(c) Construct the truth table for :

$$(p \vee q) \vee \sim p$$

6. Attempt any two parts of the following : 5×2=10

(a) Define bipartite graph. Draw $K_{2,4}$ bipartite graph also find its chromatic number.

(b) What is Euler graph? Draw a graph which is euler graph but not Hamiltonian graph.

(c) Find the minimum number of students in a class to be sure that 4 of them are born in the same month.

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Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 33211 Roll No.

B. Tech. Examination 2022-23

(Odd Semester)

DISCRETE MATHEMATICS

Time : Three Hours] *[Maximum Marks : 60*

Note :– Attempt all questions.

SECTION – A

1. Attempt all parts of the following : 8×1=8

(a) Find all subsets of the set $\{\phi\}$.

(b) Define multiset.

(c) What is the condition for which a group is a *Abelian group*?

(d) Define a lattice.

(e) Draw the truth table for XOR gate.

(f) If p : it is cold and q : it is raining. Write verbal sentence for $(p \vee \sim q)$.

(g) Define chromatic number for a graph.

(h) Find the closed form of the generating function for the sequence <1, 1, ... 1>.

SECTION–B

2. Attempt any two parts of the following : 2×6=12

(a) State and prove distributive law of set algebra.

(b) Show that power set (P (s), $\subseteq$) for any set S, is a lattice where "$\subseteq$" is subset.

(c) Solve the recurrence relation :

$$y_{n+2} - 4\,y_{n+1} + 3\,y_n = 0$$

with initial condition $y_0 = 0$ and $y_1 = 4$.

(d) Simplify the following Boolean function using three variable K-map :

$$F(A, B, C) = \Sigma(0, 1, 5, 7)$$

SECTION–C

Note :– Attempt all questions from this section.

3. Attempt any two parts of the following : 5×2=10

(a) $R = \{(x, a), (x, b), (y, c)\}$ and $s = \{(x, a), (y, c)\}$ find $R \cup S$, $R \cap S$ and $R - S$.

(b) Using mathematical induction prove that :

$$n! \geq 2^{n-1}, \text{ for } n \geq 1.$$

(c) Prove that :

$$A \times (B \cap C) = (A \times B) \cap (A \times C)$$

4. Attempt any two parts of the following : 5×2=10

(a) Show that the set {1, 2, 3, 4, 5} is not a group under addition and multiplication modulo 6.

(b) Show that (G, t_6) is a cyclic group where $G = \{0, 1, 2, 3, 4, 5\}$ also find its generator.

(c) Consider the partially order set {(2, 4, 6, 8), 1} where "2/4" means 2 divides 4. Determine whether the given poset is lattice or not.

[P. T. O.