Reg. No. : [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Question Paper Code : 23773

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Fifth Semester

Computer Science and Engineering

MA 2265 — DISCRETE MATHEMATICS

(Common to Information Technology)

(Regulations 2008)

(Common to PTMA 2265 – Discrete Mathematics for B.E. (Part-Time)
Third Semester – Computer Science and Engineering – Regulations 2009)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Find the truth table of $p \to q$.

2. Express in symbolic form of "*If it rains today, then I buy an umbrella*".

3. State pigeonhole principle.

4. In how many ways can 6 boys and 4 girls sit in a row?

5. Define in-degree and out-degree of a vertex.

6. When a graph is called an Eulerian graph?

7. Give an example of semi group and monoid.

8. State Lagrange's theorem in group theory.

9. Write the distributive inequalities of lattice.

10. Give an example of partial ordering relation.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Find the principal disjunctive normal form of $p \vee \sim q$. (8)

(ii) Show that $(p \wedge q)$ follows from the premises $\sim p$ and $p \vee q$. (8)

Or

(b) (i) Using the truth table, find the principal conjunctive normal form of the statement, $(p \wedge q) \vee (\sim p \wedge q \wedge r)$. (8)

(ii) Show that $\forall x (p(x) \vee q(x)) \Rightarrow \forall x\, p(x) \vee \exists x\, q(x)$. (8)

12. (a) (i) Prove, by Mathematical induction, that $1+2+3+4+\ldots+n = \frac{1}{2} n(n+1)$. (8)

(ii) How many positive integers n can be formed using the digits 3, 4, 4, 5, 5, 6, 7, if n has to be exceed 50, 00, 000? (8)

Or

(b) (i) Find the number of integers between 1 and 250 both inclusive that are not divisible by any of the integers 2, 3, 5 and 7. (8)

(ii) Solve the recurrence relation $a_{n+2} - 6a_{n+1} + 9y_n = 3^n$, $n \geq 0$ given $a_0 = 2$, $a_1 = 9$. (8)

13. (a) (i) Draw the complete graph K_5 with vertices A, B, C, D, E. Draw all sub graph of K_5 with 4 vertices. (8)

(ii) The adjacency matrices of two graphs G and H are given below. Examine the isomorphism of G and H by finding the permutation matrix. (8)

$$A_G = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}, A_H = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}.$$

Or

(b) (i) Prove that the number of vertices of odd degree is even. (8)

(ii) Prove that a connected graph G is Eulerian if and only if all the vertices of even degree. (8)

14. (a) Prove that $G = \left\{ \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}, \begin{bmatrix} -1 & 0 \\ 1 & -1 \end{bmatrix} \right\}$ forms an abelian group under the matrix multiplication. (16)

Or

(b) (i) Show that $(Z, +, \times)$ is a ring where Z is set of all integers. (8)

(ii) Prove that the intersection of two sub groups of $(G, *)$ is also a sub group of $(G, *)$. (8)

15. (a) (i) Draw the Hasse diagram of $A = \{2, 3, 6, 12, 24\}$ and $\leq$ is a relation such that $x \leq y$ if and only if x divides y. (8)

(ii) In a Boolean algebra, prove that $(a \vee b)' = a' \wedge b'$. (8)

Or

(b) If S_{42} is the set of divisors of 42 and D is the relation "divisor of", prove that $\{S_{42}, D\}$ is a complemented lattice. (16)
