16-11 FN

Reg. No. :

Question Paper Code : 52769

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Fifth/Sixth Semester
Computer Science and Engineering
MA2265 – DISCRETE MATHEMATICS
(Common to Information Technology)
(Regulations 2008)
(Also Common to PTMA2265 – Discrete Mathematics for BE (Part-Time) Third Semester – CSE – Regulations 2009)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. What is the contra positive of the statement "The home team wins whenever it is raining" ? (2)
2. Let P(x) denote the statement $x \leq 4$. Write the truth values of P(2) and P(6). (2)
3. State well ordering property. (2)
4. How many permutations of the letters ABCDEFGH contain the string ABC ? (2)
5. Define a bipartite graph. (2)
6. How do you find the number of different paths of length r from i to j in a graph G with adjacency matrix A ? (2)
7. Give an example of semi group but not a monoid. (2)
8. If a subset $S \neq \phi$ of G is a subgroup of $(G, *)$, then prove that for any pair of elements $a, b \in S$, $a * b^{-1} \in S$. (2)
9. Give a relation which is both a partial ordering relation and an equivalence relation. (2)
10. Give an example of a two element Boolean algebra. (2)

PART – B (5×16=80 Marks)

11. a) i) Show that the hypothesis "It is not sunny this afternoon and it is colder than yesterday", "we will go swimming only if it in sunny", "If we do not go swimming, then we will take a trip" and "If we take trip, then we will be home by sunset" lead to the conclusion "we will be home by sunset." (8)

ii) Assume that "For all positive integers n, if n is greater than 4, then n^2 is less than 2^n" is true. To show that $100^2 < 2^{100}$ by using universal modus ponens. (8)

(OR)

b) i) Without constructing truth tables, prove that $\sim p \rightarrow (q \rightarrow r) \equiv q \rightarrow (p \vee r)$. (8)

ii) Prove the implication $p \rightarrow (q \rightarrow r) \Rightarrow (p \rightarrow q) \rightarrow (p \rightarrow r)$ by using truth table. (8)

12. a) i) Prove, by mathematical induction, that

$$1 \times 2 \times 3 + 2 \times 3 \times 4 + \ldots + n(n+1)(n+2) = \frac{1}{4} n(n+1)(n+2)(n+3).$$ (8)

ii) Solve $a_{n+2} - 6a_{n+1} + 9a_n = 3(2^n) + 7(3^n),\ n \geq 0$. (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) From a club consisting of 6 men and 7 women, in how many ways can we select a committee of 4 persons that has at most one woman ? (8)

13. a) i) In a round robin tournament the team 1 beat team 2, team 3 and team 4, team 2 beat team 3 and team 4, team 3 beats team 4. Model this outcome with directed graph. (8)

ii) Show that the number of vertices of odd degree in an undirected graph is even. (8)

(OR)

b) i) If a graph, either connected or disconnected, has exactly two vertices of odd degree, prove that there is a path joining these two vertices. (8)

ii) Find an Euler path or Euler circuit if it exists in each of the following two graphs. (8)

Figure (i)

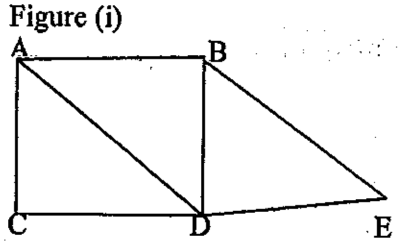
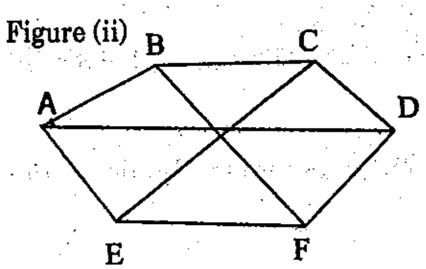


Figure (ii)



14. a) i) Show that the group $\{Z_n, +_n\}$ is isomorphism to every cyclic group of order n. (8)

ii) Prove that the set $Z_4 = \{[0], [1], [2], [3]\}$ is a commutative ring with respect to the binary operation $+_4$ and $\times_4$. (8)

(OR)

b) i) Prove that the intersection of two subgroups of a group G is also a subgroup of G. (8)

ii) State and prove the Lagrange's theorem. (8)

15. a) i) Let R be the relation on the set of people such that xRy if x is older than y. Show that R is not a partial ordering. (8)

ii) Show that the distributive law $x(y+z) = xy + xz$ is valid. (8)

(OR)

b) i) Let $S = \{a, b, c\}$, draw the diagram of the Lattice $(\rho(S), \subseteq)$. (8)

ii) Find the complements, if they exist, of the elements a, b, c of the lattice, whose Hasse diagram is given below. Can the lattice be complemented ? (8)