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

Question Paper Code : 90336

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Third Semester

Computer Science and Engineering

MA 8351 – DISCRETE MATHEMATICS

(Common to Information Technology)

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Write the following statement in symbolic form : If Avinash is not in a good mood or he is not busy, then he will go to New Delhi.

2. Write the truth table for $(p \wedge q) \rightarrow (p \vee q)$.

3. Find the number of bit strings of length 10 that either begin with 1 or end with 0.

4. In how many different ways can five men and five women sit around a table ?

5. Give an example of a graph which is Eulerian but not Hamiltonian.

6. Write the adjacency matrix and incidence matrix of $K_{2,2}$.

7. Show that the identity element of a group is unique.

8. Give an example of an integral domain which is not a field.

9. Draw the Hasse diagram of $(D_{20}, /)$, where D_{20} denotes the set of positive divisors of 20 and / is the relation "division".

10. In any lattice $(L, \leq)$, $\forall$ a, b $\in$ L, show that $a * (a \oplus b) = a$, where $a * b = \text{glb}(a, b)$ and $a \oplus b = \text{lub}(a, b)$.

PART – B (5×16=80 Marks)

11. a) i) Obtain the principal disjunctive and conjunctive normal forms of the formula $(\sim p \to r) \wedge (q \leftrightarrow p)$. (8)

ii) Show that $J \wedge S$ logically follows from the premises $P \to Q$, $Q \to \sim R$, R, $P \vee (J \wedge S)$. (8)

(OR)

b) i) Let K(x) : x is a two-wheeler, L(x) : x is a scooter, M(x) : x is manufactured by Bajaj. Express the following using quantifiers.

I. Every two wheeler is a scooter.

II. There is a two-wheeler that is not manufactured by Bajaj.

III. There is a two-wheeler manufactured by Bajaj that is not a scooter.

IV. Every two-wheeler that is a scooter is manufactured by Bajaj. (8)

ii) Use the rules of inference to show that the hypotheses "If it does not rain or if it is not foggy, then the sailing race will be held and the lifesaving demonstration will go on", "If the sailing race is held, then the trophy will be awarded", and "The trophy was not awarded" imply the conclusion "It rained". (8)

12. a) i) Solve $a_n = 8a_{n-1} + 10^{n-1}$ with $a_0 = 1$ and $a_1 = 9$ using generating function. (8)

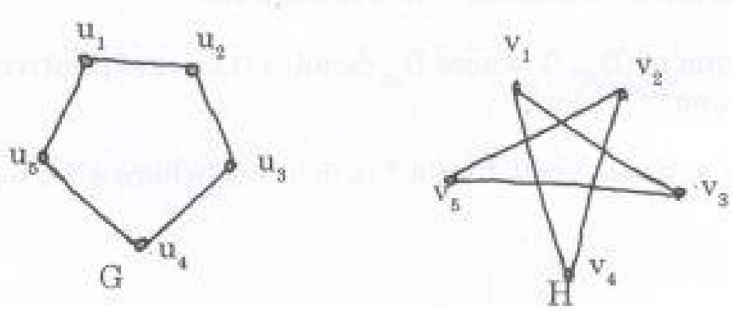
ii) How many positive integers not exceeding 1000 are divisible by none of 3, 7 and 11 ? (8)

(OR)

b) i) Using mathematical induction prove that if n is a positive integer, then 133 divides $11^{n+1} + 12^{2n-1}$. (8)

ii) How many ways are there to assign five different jobs to four different employees if every employee is assigned at least one job ? (8)

13. a) i) Check whether the following graphs are isomorphic or not. (6)



ii) If A is the adjacency matrix of a graph G with $V(G) = \{v_1, v_2, ..., v_p\}$, prove that for any $n \geq 1$, the $(i, j)^{th}$ entry of A^n is the number of $v_i - v_j$ walks of length n in G. (10)

(OR)

b) i) Define self complementary graph. Show that if G is a self complementary simple graph with n vertices then $n \equiv 0$ or $1 \pmod 4$. (6)

ii) Show that a simple graph G is Eulerian if and only if all its vertices have even degree. (10)

14\. a) State and prove Lagrange's theorem on groups. (16)

(OR)

b) i) Show that a non empty subset H of a group (G, *) is a subgroup of G if and only if $a * b^{-1} \in H$ for all $a, b \in H$. (8)

ii) Show that the Kernel of a group homomorphism is a normal subgroup of the group. (8)

15\. a) i) Show that every chain is a distributive lattice. (8)

ii) Let $D_{100} = \{1, 2, 4, 5, 10, 20, 25, 50, 100\}$ be the divisors of 100. Draw the Hasse diagram of $(D_{100}, /)$ where / is the relation "division".

Find (I) glb {10, 20} (II) lub {10, 20} (III) glb {5, 10, 20, 25}

(IV) lub {5, 10, 20, 25}. (8)

(OR)

b) i) In a Boolean Algebra, show that $(a * b)' = a' \oplus b'$ and $(a \oplus b)' = a' * b'$. (8)

ii) Define a modular lattice and prove that every distributive lattice is modular but not conversely. (8)