



B.TECH DEGREE EXAMINATIONS: APRIL/MAY 2016

(Regulation 2013)

Sixth Semester

INFORMATION TECHNOLOGY

U13MAT601 : Discrete Mathematics

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

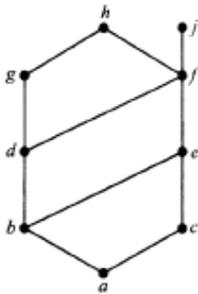
PART A (10 x 1 = 10 Marks)

- Write the set A if $A - B = \{1, 3, 7, 11\}$, $B - A = \{2, 6, 8\}$ and $A \cap B = \{4, 9\}$.
 - $\{1, 3, 7, 11\}$
 - $\{2, 6, 8\}$
 - $\{2, 4, 6, 8, 9\}$
 - $\{1, 3, 4, 7, 9, 11\}$
- The power set of $\{ \}$ is
- Write the symbolic form of the statement "If you know the rules and are overconfident then you win the game" where P: you know the rules, Q: you are overconfident and R: you win the game.
 - $(P \wedge Q) \rightarrow R$
 - $P \rightarrow (\neg Q \vee R)$
 - $\neg P \wedge (\neg Q \wedge R)$
 - $(\neg P \wedge (\neg Q \vee \neg R))$
- The truth value of $(\exists x)(P(x) \wedge Q(x))$, where $P(x) =$ "x is divisible by 6", $Q(x) =$ "x is divisible by 3" and $x \in \mathbb{N}$ is.....
- A digraph that has no parallel edges is called
 - Biparite graph
 - simple graph
 - Planar graph
 - Eulerian graph
- A simple graph with n vertices and k components can have at most.....edges.
- A relation R on a set A . If $(a, a) \in R$ for every $a \in A$ then R is said to be
 - symmetric
 - transitive
 - reflexive
 - irreflexive
- If R is a relation from $A = \{1, 2, 3\}$ to $B = \{4, 5\}$ given by $R = \{(1, 4), (2, 4), (1, 5), (3, 5)\}$ then $R^{-1} =$
- Let $(L, *, \oplus, ', 0, 1)$ be a Boolean algebra then $(a \oplus b)'$ is
 - $a' * b'$
 - $(a \oplus b)'$
 - $a' \oplus b'$
 - $(a \oplus b)$
- Let (L, \leq) be a lattice, If for any $a, b \in L$, then $a \leq b \Leftrightarrow a \wedge b =$

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11. In a class 40% of the students enrolled for Maths and 70% enrolled for Economics. If 15% of the students enrolled for both Maths and Economics, what % of the students of the class did not enroll for either of the two subjects?
12. If $A = \{0, 1\}$ and $B = \{1, a\}$ determine $A \times \{1\} \times B$.
13. Translate the sentences into propositional expressions: "Neither the fox nor the lynx can catch the hare if the hare is alert and quick."
14. Find the scope of the quantifiers in the formula $(\forall x) (P(x) \rightarrow (\exists y) R(x,y))$.
15. Define Hamiltonian graph.
16. Define Bipartite graph.
17. Define equivalence class.
18. Give an example of a relation which is symmetric, transitive but not reflexive on $\{a,b,c\}$.
19. State the distributive lattice.
20. Find the greatest lower bound and the least upper bound of $\{b, d, g\}$ from the diagram



PART C (5 x 14 = 70 Marks)

(Answer not more than 400 words)

Q.No. 21 is Compulsory

21. (a) (i) Let A and B be any two sets. Then prove that $(A \cap B) \cup (A \cap B^c) = A$. (4)
(ii) Out of 100 sportsmen in a college, 39 play Tennis, 58 play Cricket and 32 play Hockey. 10 play Cricket and Hockey, 11 play Hockey and Tennis, and 13 play Tennis and Cricket. How many play (i) All the three games (ii) Just one game (iii) Tennis and Cricket but not hockey. (10)
22. (a) (i) Determine whether the following argument is valid or invalid: If I read the newspaper in the kitchen, my glasses would be on the kitchen table. I did not read the newspaper in the kitchen. Therefore my glasses are not on the kitchen table. (7)

- (ii) Is the following conclusion validly derivable from the premises given? (7)
 If $(\forall x) (P(x) \rightarrow Q(x)), (\exists y) P(y)$ then $(\exists z) Q(z)$.

(OR)

- (b) (i) Show that $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$ (7)
 (ii) Establish the validity of the following argument : “All integers are rational numbers. Some integers are powers of 2. Therefore, some rational numbers are powers of 2”.

23. (a) (i) Are the two graphs given in the following Figure isomorphic? Why? (4)



- (ii) Prove that a simple graph with n vertices must be connected if it has more than $(n-1)(n-2)/2$ edges. (10)

(OR)

- (b) Prove that a given connected graph G is Eulerian if and only if all vertices of G are of even degree.

24. (a) (i) Define the relation P on $\{1,2,3,4\}$ by $P = \{(a,b) / |a - b| = 1\}$. Determine the adjacency matrix of P^2 . (4)

- (ii) Prove that the relation defined by ‘ aRb ’ if and only if $a - b$ is divisible by m (congruence modulo m) on the set of integers is an equivalence relation. (10)

(OR)

- (b) Let $A = \{1,2,3,4\}$ and $R = \{(1,2),(2,3),(3,4),(2,1)\}$. Using Warshall’s algorithm find the transitive closure of R . (14)

25. (a) (i) In a Boolean algebra, prove that $(a+b')(b+c')(c+a') = (a'+b)(b'+c)(c'+a)$. (7)

- (ii) Prove that $(Z^+, /)$ is a poset, where a / b means the relation a divides b , for $a, b \in Z^+$. (7)

(OR)

- (b) (i) Let $\langle L, \leq \rangle$ be a lattice, For any $a, b, c \in L$, then prove that $b \leq c \Rightarrow a * b \leq a * c, a \oplus b \leq a \oplus c$. (7)

- (ii) Consider the Boolean function $f(x_1, x_2, x_3) = ((x_1 + x_2) + (x_1 + x_3))x_1 \overline{x_2}$. (7)

Simplify the Boolean function and draw the circuit diagram for it.
