

K. J. Somaiya College of Engineering, Mumbai-77
(Autonomous College Affiliated to University of Mumbai)

End Semester Exam

MAY-JUNE 2021
(AUGUST 2021)

Max. Marks: 50

Duration: 1 Hr. 45 Min.

Class: SY

Name of the Course: Discrete Mathematics

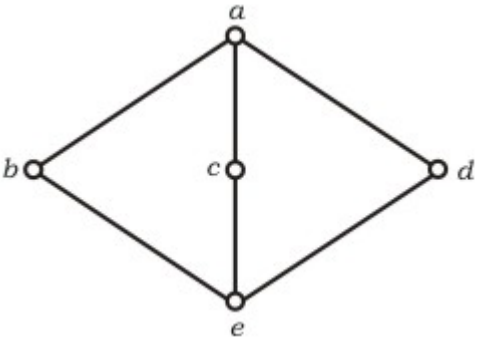
Course Code: 2UCC305

Semester: III

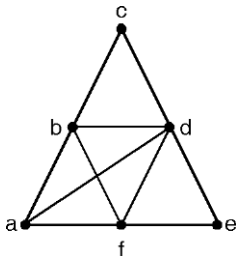
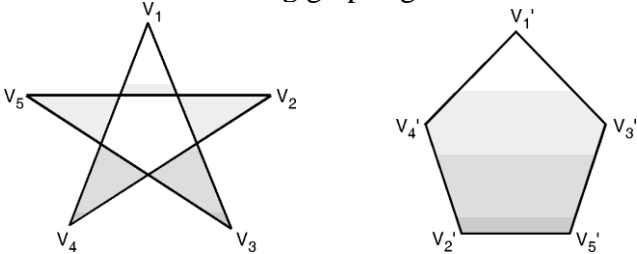
Branch: COMP

Instructions:

- (1) All questions are compulsory
- (2) Draw neat diagrams
- (3) Assume suitable data if necessary

Question No.		Max Marks
Q1 (A)	<p>1. Let $N = \{1, 2, 3, \dots\}$ be ordered by divisibility, which of the following subset is totally ordered,</p> <p>A) (24 ,6 ,2) B) (15 ,5 ,3) C) (16 ,9 ,2) D) (15 ,30 ,4)</p> <p>2. $P \rightarrow (Q \rightarrow R)$ is equivalent to A) $(P \wedge Q) \rightarrow R$ B) $(P \vee Q) \rightarrow R$ C) $(P \vee Q) \rightarrow R^{-1}$ D) None of these</p> <p>3. If P, Q, R are subsets of the universal set U, then $(P \cap Q \cap R) \cup (P^c \cap Q \cap R) \cup Q^c \cup R^c$ is A) $Q^c \cup R^c$ B) $P \cup Q^c \cup R^c$ C) $P^c \cup Q^c \cup R^c$ D) U</p> <p>4. The following is the Hasse diagram of the poset $[\{a, b, c, d, e\}, \leq]$</p>  <p>The poset is A) Lattice B) not a lattice</p>	10

	<p>C) a lattice but not a distributive lattice D) a distributive lattice but not a Boolean algebra</p> <p>5. If the function f and g are onto function then the function (gof) is _____ function A) Into function B) one to one function C) onto function D) one-to-many function</p> <p>6. The set of positive integers under the operation of ordinary multiplication is A) Not a monoid B) A group C) Not a group D) An Abelian group</p> <p>7. Which of the following statement is a proposition? A) Get me a glass of milkshake B) God bless you! C) What is the time now? D) The only odd prime number is 2</p> <p>8. Range of a function is : A) the maximal set of numbers for which a function is defined B) the maximal set of numbers which a function can take values C) it is set of natural numbers for which a function is defined D) none of above</p> <p>9. For an onto function range is equivalent to codomain. A) True B) False</p> <p>10. The transitive closure of the relation $\{(0,1), (1,2), (2,2), (3,4), (5,3), (5,4)\}$ on the set $\{1, 2, 3, 4, 5\}$ is _____ A) $\{(0,1), (1,2), (2,2), (3,4)\}$ B) $\{(0,0), (1,1), (2,2), (3,3), (4,4), (5,5)\}$ C) $\{(0,1), (1,1), (2,2), (5,3), (5,4)\}$ D) $\{(0,1), (0,2), (1,2), (2,2), (3,4), (5,3), (5,4)\}$</p>	
Q1 (B)	<p>Attempt any FIVE questions out of the following (any 5 out of 7)</p> <p>1. Find the number of integers between 1 and 1000 which are divisible by 2, 3 or 5.</p> <p>2. State the converse and contrapositive of the following. (i) If it is cold then he wears hat. (ii) If integer is a multiple of 2, then it is even.</p> <p>3. Using laws of logic prove the following. $p \vee q \vee (\sim p \wedge \sim q \wedge r) \leftrightarrow p \vee q \vee r$</p>	10

	<p>4. How many nodes are necessary to construct a graph with exactly 6 edges in which each node is of degree 2</p> <p>5. Find Euler path, Euler circuit, Hamiltonian path , Hamiltonian Circuit in the following graph</p>  <p>6. Is the following function one to one ? $g : \mathbb{Z} \rightarrow \mathbb{Z}$ where $g(x) = x^2$.</p> <p>7. Let $A = \{1, 2, 3, 4\}$ and Let $R = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 1), (3, 3), (1, 3), (4, 1), (4, 4)\}$ Determine whether the relation R on the set A is an equivalence relation.</p>	
Q. 2 a)	<p>Draw the Hasse diagram of D_{20} and check if it is lattice</p> <p style="text-align: center;">OR</p> <p>Consider the chains of divisors of 4 and 9 i.e. $L_1 = \{1, 2, 4\}$ and $L_2 = \{1, 3, 9\}$ and partial ordering relation of division on L_1 and L_2. Draw the lattice $L_1 \times L_2$.</p>	05
Q. 2 b)	<p>Prove that following by mathematical induction : $2 + 5 + 8 + \dots + (3n - 1) = n(3n + 1)/2$</p>	05
Q. 3 a)	<p>Determine if following graphs g and G are isomorphic or not.</p> 	05
Q. 3 b)	<p>A function $f : \mathbb{R} - \left\{\frac{7}{3}\right\} \rightarrow \mathbb{R} - \left\{\frac{4}{3}\right\}$ is defined as : $f(x) = \frac{4x - 5}{3x - 7}$ Prove that 'f' is bijective.</p>	05
Q. 4	<p>Consider the parity check matrix H given by</p> $H = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$	10

Determine the group code $eH : B^2 \rightarrow B^5$

OR

Consider the (3, 6) encoding function $e : B^3 \rightarrow B^6$ defined by

$e(000) = 000000$

$e(001) = 001100$

$e(010) = 010011$

$e(011) = 011111$

$e(100) = 100101$

$e(101) = 101001$

$e(110) = 110110$

$e(111) = 111010$

Decode the following words relative to a maximum likelihood decoding function. (a) 000101 (b) 010101