

K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Nov – Dec 2023		
B.Tech Program: Computer Engineering	Scheme: IIB	
Examination: SY Semester: III		
Course Code: CEC302 and Course Name: Discrete Structure & Graph Theory		
Date of Exam: 08/12/2023	Duration: 02 Hours	Max. Marks: 45

Instructions:

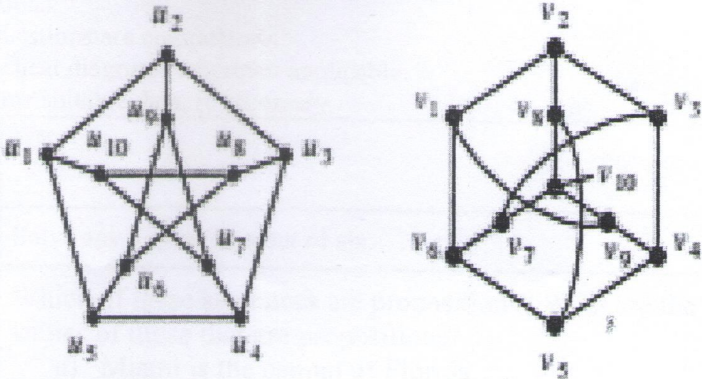
- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data, if necessary.

		Max Marks	CO	BT level
Q 1	Solve any 5 questions out of six.	15		
i)	Which of these sentences are propositions? What are the truth values of those that are propositions? a) Miami is the capital of Florida b) $x + 2 = 11$ c) $3+4=12$	3	CO1	Ap
ii)	List the members of these sets a) $\{x \mid x \text{ is a positive integer less than } 12\}$ b) $\{x \mid x \text{ is the square of an integer and } x < 100\}$ c) $\{x \mid x \text{ is an integer such that } x^2 = 2\}$	3	CO2	Ap
iii)	Answer these questions for the poset $(\{2, 4, 6, 9, 12, 18, 27, 36, 48, 60, 72\},)$. a) Find the maximal elements. b) Find the minimal elements. c) Is there a greatest element?	3	CO3	Ap
iv)	An office building contains 27 floors and has 37 offices on each floor. How many offices are in the building?	3	CO4	Ap
v)	Define algebraic structures? List properties of algebraic structures	3	CO5	U
vi)	Find the number of vertices, the number of edges, and the degree of each vertex in the given undirected graph. <div style="text-align: center;"> </div>	3	CO6	Ap

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Q.2	Solve any three questions out of four.	15		
i)	<p>Schedule the tasks needed to cook a Chinese meal by specifying their order, if the Hasse diagram representing these tasks is as shown here.</p> <pre> graph TD A[Find recipe] --> B[Buy groceries] A --> C[Buy seafood] B --> D[Wash vegetables] B --> E[Chop water chestnuts] B --> F[Make garnishes] C --> G[Wash shellfish] C --> H[Cut fish] G --> I[Clean fish] D --> J[Cook in wok] E --> J F --> J G --> J I --> J J --> K[Arrange on platters] K --> L[Serve] </pre> <p>Determine the following questions</p> <ol style="list-style-type: none"> Find all chains in the posets with the Hasse diagrams Find all antichains in the posets with the Hasse diagrams Find the least upper bound, greatest lower bound, upper bound and lower bound. Find the Maximum, minimum, minimal and maximal element 	5	CO3	Ap
ii)	<p>Prove using Mathematical Induction $2+5+8+\dots+(3n-1)=n(3n+1)/2$, where $n \geq 1$</p>	5	CO1	Ap
iii)	<p>Express each of these statements using predicates and quantifiers.</p> <ol style="list-style-type: none"> A passenger on an airline qualifies as an elite flyer if the passenger flies more than 25,000 miles in a year or takes more than 25 flights during that year. A man qualifies for the marathon if his best previous time is less than 3 hours and a woman qualifies for the marathon if her best previous time is less than 3.5 hours 	5	CO1	Ap

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iv)	Determine the following graphs are isomorphism or not <div style="display: flex; justify-content: space-around; align-items: center;">  </div>	5	CO6	Ap
Q.3	Solve any three questions out of four.	15		
i)	Consider the (3,5) group encoding function. $e: B^3 \rightarrow B^5$ defined by $e(000)=00000$ $e(100)=10011$ $e(001)=001100$ $e(101)=10101$ $e(010)=01001$ $e(110)=11010$ $e(011)=01111$ $e(111)=11100$	5	CO5	Ap
ii)	Prove that $z_4 = \{0,1,2,3\}$ is an abelian group w.r.t 'addition modulo'	5	CO5	Ap
iii)	Construct a relation on the set $\{a, b, c, d\}$ that is a) reflexive, symmetric, but not transitive. b) irreflexive, symmetric, and transitive. c) irreflexive, antisymmetric, and not transitive. d) reflexive, neither symmetric nor antisymmetric, and transitive. e) neither reflexive, irreflexive, symmetric, antisymmetric, nor transitive	5	CO2	Ap
iv)	Solve the following recurrence relation using iteration method $a_n = 3a_{n-1} + 1$, where $a_0 = 1$	5	CO4	Ap
