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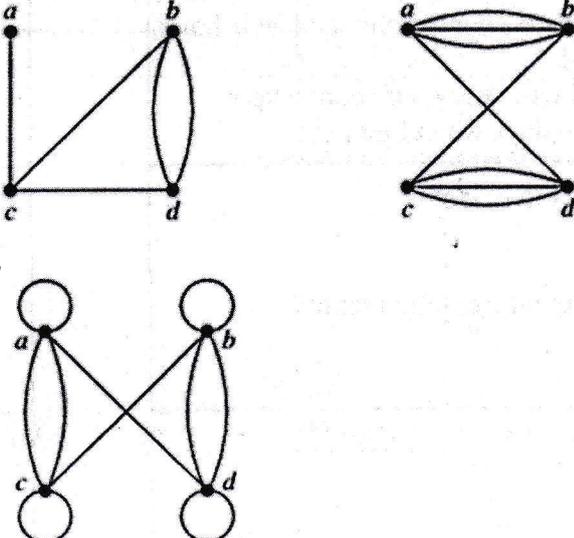**(Autonomous College Affiliated to University of Mumbai)**

Jan-Feb 2026
~~Nov – Dec 2025~~

(B. Tech) Program: Computer Engineering Scheme: III
Regular Examination: SY Semester: VIII
Course Code: CEC305 and Course Name: Discrete Structure & Graph Theory

Date of Exam: ~~02/12/2025~~ 05/02/26   Duration: 02.5 Hours   Max. Marks: 60

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

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any **two** questions out of three: (05 marks each)	10		
a)	Write each of these propositions in the form "p if and only if q" in English. a) If it is hot outside, you buy an ice cream cone, and if you buy an ice cream cone it is hot outside. b) For you to win the contest it is necessary and sufficient that you have the only winning ticket. c) You get promoted only if you have connections, and you have connections only if you get promoted. d) If you watch television your mind will decay, and conversely. e) The trains run late on exactly those days when I take it.		CO1	AP
b)	Give an example of a function from N to N that is a) one-to-one but not onto. b) onto but not one-to-one. c) both onto and one-to-one (but different from the identity function). d) neither one-to-one nor onto.		CO2	AP
c)	Answer these questions for the poset ({3,5,9,15, 24,45}, |). a) Find the maximal elements. b) Find the minimal elements. c) Is there a greatest element? d) Is there a least element? e) Find all upper bounds of {3,5}. f) Find the least upper bound of {3,5}, if it exists. g) Find all lower bounds of {15,45}. h) Find the greatest lower bound of {15,45}, if it exists.		CO3	AP

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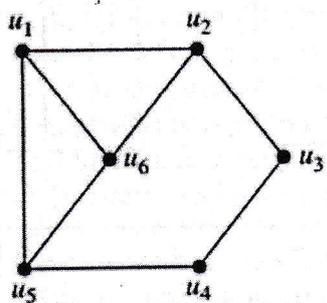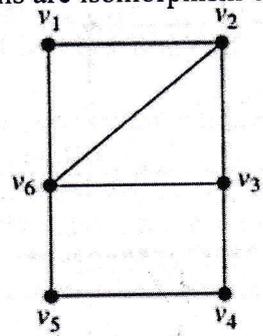Date of Exam: ~~02/12/2025~~ 05/02/26   Duration: 02.5 Hours   Max. Marks: 60

Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	How many students are enrolled in a course either in calculus, discrete mathematics, data structures, or program ming languages at a school if there are 507, 292, 312, and 344 students in these courses, respectively; 14 in both calculus and data structures; 213 in both calculus and programming languages; 211 in both discrete mathematics and data structures; 43 in both discrete mathematics and programming languages and no student may take calculus and discrete mathematics, or data structures and programming languages, concurrently?		CO4	AP
b)	Show that the G = {1,5,7,11} is an abelian group under multiplication modulo 12		CO5	AP
c)	Find the adjacency matrix for the following graphs		CO6	AP
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	A detective has interviewed four witnesses to a crime. From the stories of the witnesses the detective has concluded that if the butler is telling the truth then so is the cook; the cook and the gardener cannot both be telling the truth; the gardener and the handyman are		CO1	AP

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			CO	AP
	not both lying; and if the handyman is telling the truth, then the cook is lying. For each of the four witnesses, can the detective determine whether that person is telling the truth or lying? Explain your reasoning.			
b)	Define minimum hamming distance. Find the code words generated by the parity check matrix H given below. $$\begin{matrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{matrix}$$		CO5	AP
c)	Determine whether these graphs are isomorphism or not		CO6	AP
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	Solve the following using warshall's algorithm for finding transitive closure of a relation a) $\{(1,2), (2,1), (2,3), (3,4), (4,1)\}$ b) $\{(2,1), (2,3), (3,1), (3,4), (4,1), (4,3)\}$		CO2	AP
b)	Consider (2,5) encoding function e: $B^2 \to B^5$ defined by e (00) = 00000 e (01) = 01110 e (10) = 10101 e (11) = 11011 Let d be the (2,5) maximum likelihood decoding function associated with e. How many errors can (e,d) can correct and detect.		CO5	AP

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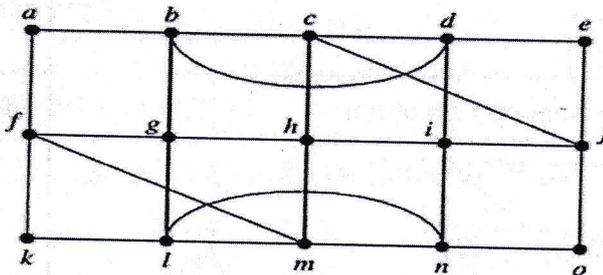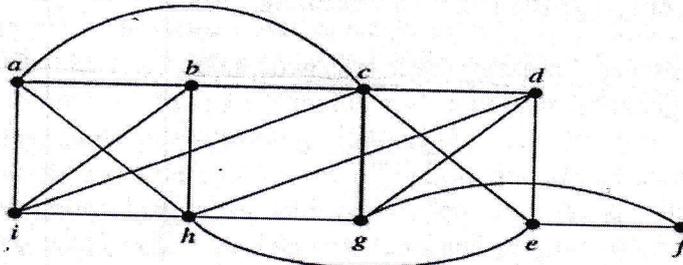
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c)	Define Euler path and circuit, Hamiltonian path and circuit. Determine the following graphs has Euler path and circuit and Hamiltonian path and circuit	CO6	AP

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