

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

Nov – Dec 2025

(B. Tech) Program: Computer Engineering Scheme: III

Regular Examination: SY Semester: III

Course Code: CEC305 and Course Name: Discrete Structure & Graph Theory

Date of Exam: 02/12/2025

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 <b>two</b> questions out of three: (05 marks each)	10		
a)	Let p, q, and r be the propositions p: You get an A on the final exam. q: You do every exercise in this book. r: You get an A in this class. Write these propositions using p, q, and r and logical connectives (including negations). a) You get an A in this class, but you do not do every exercise in this book. b) You get an A on the final, you do every exercise in this book, and you get an A in this class. c) To get an A in this class, it is necessary for you to get an A on the final. d) You get an A on the final, but you don't do every exercise in this book nevertheless, you get an A in this class. e) Getting an A on the final and doing every exercise in this book is sufficient for getting an A in this class.		CO1	AP
b)	Consider these functions from the set of teachers in a school. Under what conditions is the function one-to-one if it assigns to a teacher his or her a) office. b) assigned bus to caretaker in a group of buses taking students on a field trip. c) salary. d) social security number.		CO2	AP
c)	Determine whether these Posets are lattices. a) $(\{1,3,6,9,12\},  )$ b) $(\{1,5,25,125\},  )$ c) $\{1,2,3,6,12,24,36,48,  \}$ .		CO3	AP

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Course Code: CEC305 and Course Name: Discrete Structure & Graph Theory

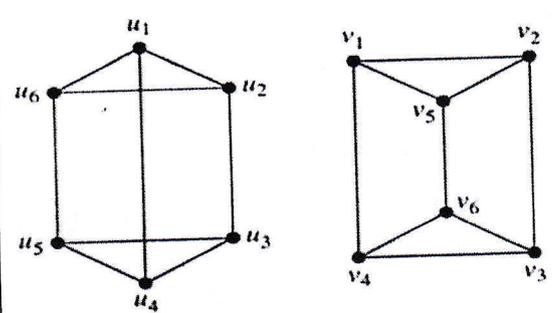
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Q 2	Solve any <b>two</b> questions out of three: (05 marks each)	10		AP
a)	<p>Solve the following scenario using Principle of Inclusion and Exclusion</p> <p>There are 345 students at a college who have taken a course in calculus, 212 who have taken a course in discrete mathematics, and 188 who have taken courses in both calculus and discrete mathematics. How many students have taken a course in either calculus or discrete mathematics?</p>		CO4	AP
b)	What is a group? Calculate the multiplication modulo 25 of given set $\{5,10,15,20\}$ is a abelian group or not.		CO5	AP
c)	<p>Find the adjacency matrix for the following graphs</p>		CO6	AP
Q.3	Solve any <b>two</b> questions out of three. (10 marks each)	20		
a)	<p>Five friends have access to a chat room. Is it possible to determine who is chatting if the following information is known?</p> <p>Either Kevin or Heather, or both, are chatting.</p> <p>Either Randy or Vijay, but not both, are chatting.</p> <p>If Abby is chatting, so is Randy.</p> <p>Vijay and Kevin are either both chatting or neither is.</p>		CO1	AP

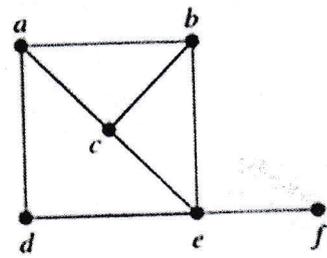
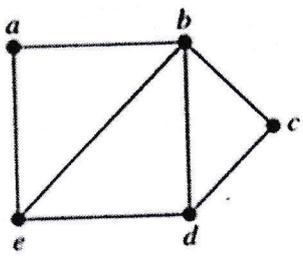
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	If Heather is chatting, then so are Abby and Kevin. Explain your reasoning.		
b)	Consider (3,8) encoding function $e: B^3 \rightarrow B^8$ defined by $e(000)=00000000$ $e(001)=10111000$ $e(100)=10100100$ $e(101)=10001001$ $e(010)=00101101$ $e(110)=00011100$ $e(011)=10010101$ $e(111)=00110001$  Let $d$ be the (8,3) maximum likelihood decoding function associated with $e$ . How many errors can $(e,d)$ correct.	CO5	AP
c)	Determine whether the graphs are not 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) $\{(b,c), (b,e), (c,e), (d,a), (e,b), (e,c)\}$ b) $\{(a,b), (a,c), (a,e), (b,a), (b,c), (c,a), (c,b), (d,a), (e,d)\}$	CO2	AP
b)	Consider the (2,6) group encoding function $e: B^2 \rightarrow B^6$ defined by $e(00) = 000000,$ $e(01) = 011110,$ $e(10) = 101101,$ $e(11) = 110011$ Decode the following relative to maximum likelihood decoding function 1)001110 2)111101 3)110010	CO5	AP

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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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Seat No.: