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

June 2025

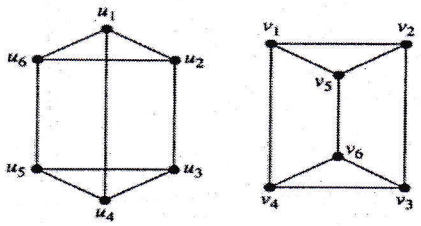
(B. Tech / M. Tech.) Program: Artificial Intelligence & Data Science Scheme :-IIB

Carry-on Regular Examination: SY Semester: III

Course Code: AIC305 and Course Name: Discrete structure& Data Science

Date of Exam: 02/07/25 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)	Using Laws of Logic find if the given statement $[(p \rightarrow q) \wedge \sim q] \rightarrow \sim p$ is a tautology or contradiction		CO1	An
b)	Define partition set. Let S={1,2,3,4,5,6,7,8,9}.Determine whether or not the following is a partition of S. (i){{1,2,5},{3,6},{4,8,9,7}} (ii){{1,5},{2,4,6,8},{7,9}}		CO2	An
c)	Draw Hasse diagram for D_{30}. Give Proper steps for the same. Give Chain and Antichain if exists.		CO3	Ap
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Explain Extended Pigeon hole principle. Show that 7 colours are used to paint 50 bicycles, at least 8 bicycles will be of same color		CO4	Ap
b)	Prove that set G = {1,2,3,4,5,6} is a finite abelian group of order 6 with respect to multiplication module 7		CO5	An
c)	Explain Isomorphic Graphs. Determine if the given graphs are isomorphic graphs or Not. Give Proper steps and one-one correspondence. 		CO6	Ap

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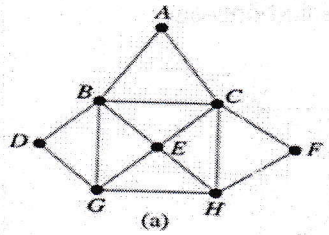
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	Prove using Mathematical induction $1^2+2^2+3^2+\ldots\ldots+n^2 = n\ (n+1)\ (2n+1) / 6$		CO1	Ap
b)	Solve the Recurrence relation: $a_n = -3a_{n-1}a_{n-2}-a_{n-3}$ with $a_0=5, a_1=-9, a_2=15$		CO4	Ap
c)	Let $H=\begin{bmatrix}1&1&0\\0&1&1\\1&0&0\\0&1&0\\0&0&1\end{bmatrix}$ be a parity check matrix. i) Compute the encoding function $e_H: B^2 \rightarrow B^5$ Decode the following words relative to a maximum likelihood decoding function i)01111 ii)01110 iii)11001		CO5	Ap
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	Let f:R→ R, f(x)=x2-1,g(x)=$4x^2$+2 find (i) fo(gof) (ii)go(fog)		CO2	Ap
b)	Find the greatest lower bound and least bound of the set {3,9,12} and {1,2,4,5,10} if they exist in the Poset (z+/) where / is the relation of divisibility.		CO3	An
c)	Define Eulerian path , Eulerian Circuit ,Hamiltonian Path and Hamiltonian Circuit with proper example. Mention the same for the given Graph(if exists)  (a)		CO6	Ap

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