AIDS / AIC305

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

Nov – Dec 2024-2025
(B. Tech) Program: Artificial Intelligence & Data Science Scheme :- ~~III~~ III
Regular Examination: SY Semester: III
Course Code: AIC305 and Course Name: Discrete structure& Data Science
Date of Exam: 30/11/2024 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)	Prove $(p \wedge q)$ and $\sim p \vee \sim q)$ are Logically equivalent (De Morgan's laws)		1	Ap
b)	Consider the set A {1,2,3, 4, 5) Find the cardinality of relation R= {<x, y>\x,y∈A and x ≤y}. Write the matrix and draw the graph which representing R.		2	Ap
c)	Consider the lattices L1= {1, 2, 4}, L2={11,3, 91}. Under divisibility. Draw the lattice L1 x L2.		3	Ap
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	How many different binary numbers can be generated if the length of the number is 5 ?		4	Ap
b)	Define Monoid and it's conditions.		5	Ap
c)	Can a single graph of 8 vertices have 40 edges excluding self-loop?		6	U
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	Solve that $1^3+2^3+3^3+\ldots\ldots n^3=(1+2+3+\ldots\ldots)^2$ by Mathematical Induction		1	Ap
b)	Solve the recurrence relation $2a_{n+2}-11a_{n+1}+5a_n=0; n\geq 0, a_0=2, a_1=-8$		4	An
c)	Consider the (3,5) group encoding function e :$B^3 \rightarrow B^5$ defined by e(000)=00000 e(100)=10011 e(001)=00110 e(101)=10101 e(010)=01001 e(110)=11010 e(011)=01111 e(111)=11100 Decode the following words relative to maximum likelihood decoding function. i) 11001 ii) 01010 iii) 00111.		5	Ap

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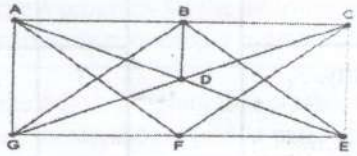
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	Let A= {1,2,3,4} and Let R = (1,1),(1,4), (2,2), (2,3), (3,2), (3,3), (4,1), (4,4). Find Transitive closure by Warshall's algorithm		2	An
b)	For the set X={ 2,3,6,12,24,36},a relation ≤ is defined as x≤y if x divide y. Draw the Hasse diagram for (x,≤). Answer the following i) What are the maximal and minimal elements? ii) Give one example of chain and antichain Is the Poset is lattice.		3	Ap
c)	Determine the Eulerian path circuit if any ,in the following graphs which is shown in fig 		6	Ap

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