K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai) 31/01/25

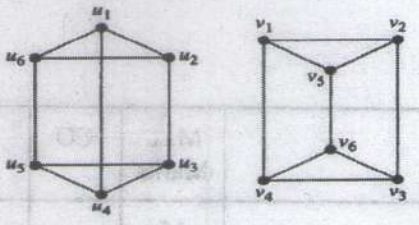
Subject Code:AIC302 Subject Name: Discrete Structures and Graph Theory Date: ~~30/11/2024~~

~~Nov – Dec 2024~~ Jan / Feb 2025

(B.Tech) Program: Artificial Intelligence and Data Science
Examination: SY Semester: III
Course Code: AIC302 and Course Name: Discrete Structures and Graph Theory
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)	Using Laws of Logic find if the given statement $[(p \rightarrow q) \wedge \sim q] \rightarrow \sim p$ is a tautology or contradiction	3	CO1	Ap
ii)	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}}	3	CO2	An
iii)	Draw the Hasse diagram of the set {*1, 2, 3, 4,12*} under partial order relation divides.	3	CO3	Ap
iv)	If any 5 numbers are chosen from 1 to 8, show that the sum of two of them will be 9.	3	CO4	Ap
v)	Prove that set G = {1,2,3,4,5,6} is a finite abelian group of order 6 with respect to multiplication module 7	3	CO5	An
vi)	Is every Hamiltonion graph Eulerian? Explain with the help of an example.	3	CO6	U
Q.2	Solve any three questions out of four.	15		
i)	Prove using Mathematical induction $1^2+2^2+3^2+\ldots\ldots+n^2 = n\ (n+1)\ (2n+1) / 6$	5	CO1	Ap

ii)	Show that the set of all divisors of 70 form a lattice.	5	CO3	Ap
iii)	Determine if the following graphs are isomorphic or not. Give reasons. 	5	CO6	An
iv)	Define Planar Graphs. A connected planar graph has 10 vertices each of degree 3. Into how many regions does a representation of this planar graph split the plane?	5	CO6	U
Q.3	Solve any three questions out of four.	15		
i)	Let R be the relation on the set of real numbers such that aRb if and only if a - b is an integer. Prove that R is an equivalence relation.	5	CO2	An
ii)	Let A = {1, 2, 3, 4} and let R = {(1, 1), (1, 2), (1, 4), (2, 4), (3, 1), (3, 2), (4, 2), (4, 3), (4, 4)}. Find transitive closure of R using Warshall's algorithm.	5	CO2	An
iii)	Find the solution of the recurrence relation $a_n = 6a_{n-1} - 11a_{n-2} + 6a_{n-3}$ with the conditions $a_0 = 2$, $a_1 = 5$ and $a_2 = 15$.	5	CO4	An
iv)	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. a) Compute the encoding function $e_H: B^2 \rightarrow B^5$ b) Decode the following words relative to a maximum likelihood decoding function i)01111 ii)01110 iii)11001	5	CO5	An

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