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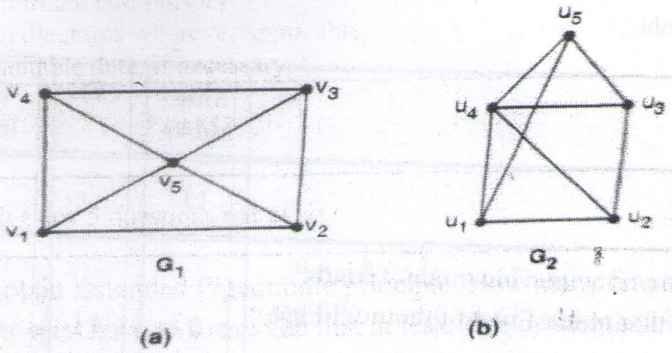
K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Subject Code: AIC302 Subject Name: Discrete Structure & Graph Theory Date: 4/. 3/2024

Supplementary Exam – Feb - March 2024
(B.Tech) Program: Artificial Intelligence & Data Science
Examination: SY Semester: III
Course Code: AIC 302 Course Name: Discrete Structure & 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)	Explain Extended Pigeonhole principle. How many friends you must have to guarantee that at least five of them will have birthdays in the same month.	3	1	U
ii)	Find the generating function for the following finite sequence. 2, 2, 2, 2, 2, 2	3	2	Ap
iii)	Explain the terms following terms giving examples: (a) Group (b) Poset	3	3	Ap
iv)	Use Mathematical induction to show that $n^3 + 2n$ is divisible by 3 for all $n \geq 1$	3	4	U
v)	Test whether the following function is on-to-one, onto or both. $f: Z \rightarrow Z, f(x) = x^2 + x + 1$	3	5	Ap
vi)	Let A = {a,b,c}. Draw the Hasse diagram for $(p(A), \subseteq)$	3	6	U
Q.2	**Solve any three questions out of four.**	**15**		
i)	Prove by Mathematical Induction that $1+2+2^2+2^3+.....+2^n = 2^{n+1} - 1$	5	1	Ap

ii)	Find the complement of each element in D_{42} .	5	3	Ap
iii)	Determine if the following graphs (G1 & G2 respectively) are isomorphic or not.  	5	6	An
iv)	What is the necessary and sufficient condition for Euler path and circuit	5	6	U
Q.3	**Solve any three questions out of four.**	**15**		
i)	Let A = {1, 2, 3, 4, 5}, and let R = { (1,1), (1,3), (1,4), (2,2), (2,5), (3,1), (3,3), (3,4), (4,1), (4,3), (4,4), (5,2), (5,5) }. Is R 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)	Solve $a_n - 7a_{n-2} + 6a_{n-3} = 0$ where $a_0 = 8$, $a_1 = 6$ and $a_2 = 22$.	5	CO4	An
iv)	Prove that the set G = {0,1,2,3,4,5} is a finite abelian group of order 6 with respect to addition modulo 6.	5	CO5	An

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