

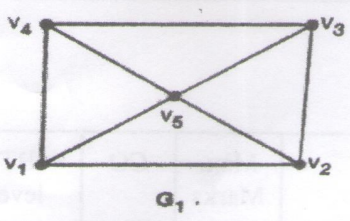
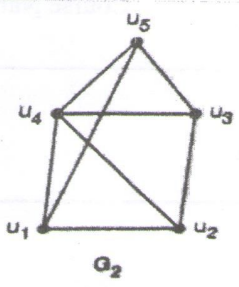
K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Subject Code: AIC302

Subject Name: Discrete Structure & Graph Theory

Date: 6/12/2022

Nov – Dec 2022 (B.Tech) Program: Artificial Intelligence & Data Science Examination: SY Semester: III				
Course Code: AIC 302 Duration: 02 Hours		Course Name: Discrete Structure & Graph Theory 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)	Prove induction to show that $n! \geq 2^{n-1}$ for $n=1,2,\dots$	3	1	
ii)	Let $f: \text{ROR}$ where $f(x) = 2x - 1$ and $f^{-1}(x) = (x+1)/2$. Find $(f \circ f^{-1})(x)$	3	2	Ap
iii)	Draw the Hasse diagram of the following set under the Partial ordering relation divide and indicate those which is chains $A = \{1,3,5,15,30\}$	3	3	Ap
iv)	State and Explain Extended Pigeonhole principle.	3	4	U
v)	Find the generating function for the following finite sequence. 1, 1,1,1,1,1	3	5	Ap
vi)	Write the Procedure to draw the Hasse diagram	3	6	U
Q.2	Solve any three questions out of four.	15		
i)	Prove by Mathematical Induction that $1+2+2^2+2^3+\dots+2^n = 2^{n+1} - 1$	5	1	Ap
ii)	Find the complement of each element in D_{42} .	5	3	Ap

iii)	Determine if the following graphs (G_1 & G_2 respectively) are isomorphic or not.  <p style="text-align: center;">G_1</p> <p style="text-align: center;">(a)</p>  <p style="text-align: center;">G_2</p> <p style="text-align: center;">(b)</p>	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 $A = \{a,b,c,d\}$, and let $P = \{ \{a,b\}, \{c\}, \{d\} \}$ Find the equivalence relation induced by P and construct its diagram	5	2	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	2	An
iii)	What is the solution of the recurrence relation $a_n = 6a_{n-1} - 9a_{n-2}$ with the initial condition $a_0 = 1$ and $a_1 = 6$?	5	4	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	5	An
