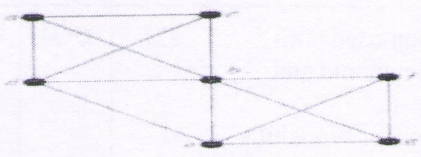
**K. J. Somaiya Institute of Technology, Sion, Mumbai-22**
**(Autonomous College Affiliated to University of Mumbai)**

Subject Code: CEC302 Subject Name: Discrete Structure & Graph Theory
Date: 27-05-2023

May-June-2023
(B.Tech) Program: Computer Engineering
Examination: SY Semester: III
Course Code: CEC302and 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) | Construct the truth tables for the following statements. Find whether they are taulology, contradiction or contingency<br>1.P->P<br>2.[(P->(q->r)]->[(p->q)->r)] | 3M | CO1 | AP |
| ii) | Let the functions f,g and h defined as follows:<br>a)f:R⇒R,f(x)=2x+3 b)g:R⇒R,g(x)=3x+4 c) h:R⇒R,h(x)=4x<br>.Find gof, fog, gofoh | 3M | CO2 | AP |
| iii) | Find the greatest lower bound and least upper bound of the set {3 , 9, 12} and {1 , 2, 4 , 5, 10} if they exists in the poset (z+ , / ). where / is the relation of divisibility | 3M | CO3 | AP |
| iv) | A drawer contains 12 red and 12 blue socks, all unmatched. A person takes socks out at random in the dark. How many socks must he take out to be sure that he has at least two blue socks? Solve using Pigeon hole principle | 3M | 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 modulo 7 | 3M | CO5 | Ap |
| vi) | Determine Euler cycle and path in graph shown below<br>  | 3M | CO6 | Ap |

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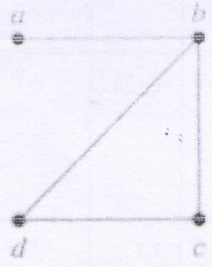
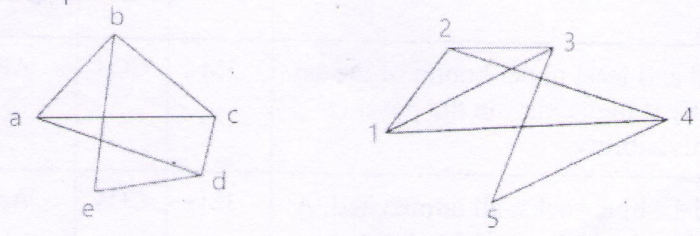
| Q.2 | Solve any three questions out of four. | 15 | | |
| i) | Show that using mathematical Induction<br>$1 \cdot 2 + 2 \cdot 3 + 3 \cdot 4 + \ldots + n(n+1) = (1/3)\{n(n+1)(n+2)\}$<br>where n>=1 | 5M | CO1 | Ap |
| ii) | Define reflexive closure and symmetric closure of a relation. Also find reflexive and symmetric closure of<br>R. A={1,2,3,4} R={(1,1),(1,2),(1,4),(2,4),(3,1),(3,2),(4,2),(4,3),(4,4)} | 5M | CO3 | Ap |
| iii) | Determine Hamiltonian Cycle and path in graph shown in figure below<br>  | 5M | CO6 | Ap |
| iv) | Define Isomorphic graphs. Show that following graphs are Isomorphic or not<br>  | 5M | CO6 | An |
| Q.3 | Solve any three questions out of four. | 15 | | |
| i) | Given S= {1,2,3,4} and a Relation R on S given by<br>R={(4,3},(2,2),(2,1),(3,1),(1,2)}<br>a)Show that R is not transitive<br>b)Find transitive closure of R by Warshall's algorithm | 5M | CO2 | Ap |
| ii) | Among 50 patients admitted to a hospital, 25 are diagnosed with pneumonia, 30 with bronchitis, and 10 with both pneumonia and bronchitis. Determine:<br>(a) The number of patients diagnosed with pneumonia or bronchitis (or both). | 5M | CO4 | Ap |

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|---|---|---|---|---|
| | (b) The number of patients not diagnosed with pneumonia or bronchitis | | | |
| iii) | Consider the (3,6) encoding function e : B3⇒B6B3⇒B6 defined by e(000) = 000000 e(001) = 001100 e(010) = 010011 e(011) = 011111 e(100) = 100101 e(101) = 101001 e(110) = 110110 e(111) = 111010 Decode the following words relative to a maximum likelihood decoding function. i) 000101 ii) 010101 | 5M | CO5 | Ap |
| iv) | Explain the properties of Algebriac structures with example. | 5M | CO5 | U |

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