comp SE| sem III   R20   c scheme   04-06.25

Time: Marks: 80

N.B. : (1) Question Number 1 is compulsory 2) Solve any three questions from
the remaining questions
3) Make suitable assumptions if needed
4) Assume appropriate data whenever required. State all assumptions
clearly.

1. a. Explain the following terms partition set with suitable example.   5
1. Partition set
2. Disjoint sets

b. Construct the Truth Table and check if the following statement is tautology.   5
$(P \rightarrow Q) \leftrightarrow (\neg Q \rightarrow \neg P)$

c. Let $f : A \rightarrow B$ be a Function from A to B . Prove that f^{-1} exists if and only if f is a   5
Bijective Function.

d. Prove by mathematical induction that   5
$x^n - y^n$ **is divisible by x-y**

2 a Define Equivalence Relation. A relation R is called circular if aRb and bRc imply   8
cRa. Show that R is circular if and only if it is an Equivalence Relation

b. Let A = {1,2,3,4}   8
and 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.

c Let $f: R \rightarrow R$ be a function defined by f(x)=2x-3. Prove that it is Bijective & find   4
inverse.

3 a Let f,g,h be functions on real numbers R defined as follows: 8
f(x) = 2x+5,   g(x) = 5x + 3,   h(x) = 3x
Find: 1) fog   2) g o f   3) g o h   4) f o g o h   5) g o f o h

b Give the generating function for the following sequences   8
1) {0,1,2,3,4...}
2) {1,2,3,4,5 ...}
3) {2,2,2,2,2...}
4) { 0,0,0,1,1,1,1,...}
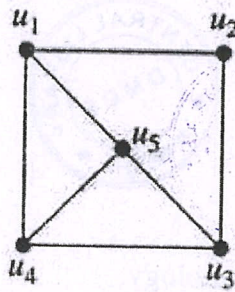
Prog code
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gp code

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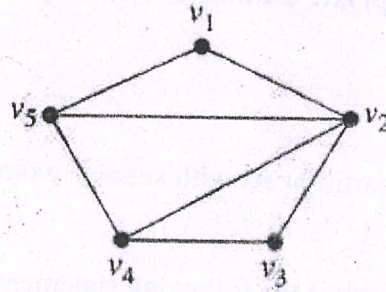
c   Determine whether the following graphs are isomorphic. Justify your answer.   4

G1   G2

4   a   A Function $f: R - \{(7/3)\} \to R - \{4/3\}$ is defined as $f(x) = (4x - 5)/(3x - 7)$ 8

Prove that f is Bijective and find the rule for f^{-1}

b   Show that the (2, 5) encoding function $e: B^2 \to B^5$ defined by   8
    $e(00) = 00000$ $e(01) = 01110$
    $e(10) = 10101$ $e(11) = 11011$ is a group code.

c   How many numbers must be selected from the set $\{1,2,3,4\}$ to guarantee that at least one pair of these will add up to 7.   4

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5   a   Define Euler Path, Euler Circuit, Hamiltonian Path and Hamiltonian Circuit.   8
Determine if the following diagram has Euler Path, Euler Circuit, Hamiltonian
Path and Hamiltonian Circuit and state the path /circuit.
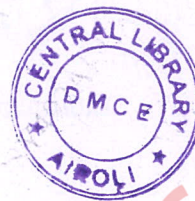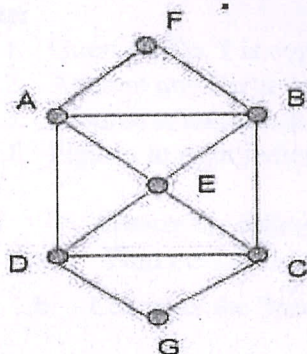
   b   Prove that the set of Real numbers under * defined by a*b=a+b-2 is a group   8

   c   Find the complement of each element in D_{42} 4

6.   a   Draw the Hasse Diagram of D_{60} and check whether it is a Lattice.   8

   b   Solve the recurrence relation $a_{n+2} - 5a_{n+1} + 6a_n = 2$ 8

with initial conditions $a_0=1$, $a_1 = -1$

   c   Define the following with suitable example.   4
a)Equivalence Class b) Sub group   c) Distributive Lattice d) Injective Function

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