

20/3/24 ATUT

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DURATION: - 2½ hrs

-FUT- 714051223 - CGDS (23)

MARKS:- 75

Note: - (1) All questions are compulsory.

(2) All questions carry equal marks.

(3) Figures to the right indicates full marks

Q.1) Attempt Any '3' of the following :-

15M

1) In a school there are 20 teachers who teach mathematics or physics. Out of these 12 teach mathematics and 4 teach both physics and mathematics. How many teach physics.

CO1-A

2) In a group of 65 people, 40 like cricket, 10 like both cricket and tennis. How many like tennis only and not cricket? How many like tennis?

CO1-A

3) Prove that for any 3 set $A = \{1,2,3\}$, $B = \{2,4,6\}$ and $C = \{1,5\}$ $A \times (B \cup C) = (A \times B) \cup (A \times C)$

CO1-E

4) Let $A = \{1,2,3,4\}$ Let $R = \{(1,2)(1,3)(1,4)(2,3)(3,1)(3,3)(4,2)\}$ and $S = \{(1,3)(2,2)(3,2)(4,2)\}$ Find (i) $Ro(Sos)$ (ii) Is $RoS = SoR$? (iii) $RoRoR$

CO1-A

5) Let R be a relation on Z , Defined by xRy if and only if $5x + 6y$ is divisible by 11, for $x, y \in z$. Show that R is an equivalence relation on Z .

CO1-A

6) Let $A = \{1,2,3,4,5\}$ and R be a partial order relation defined as $R = \{(1,1)(2,2)(3,3)(4,4)(5,5)(5,3)(3,1)(4,3)(4,2)(4,1)(2,1)\}$ Find Hasse diagram of poset A

CO1-A

Q.2) Attempt Any '3' of the following :-

15M

1) State whether the given function is on to or not, if $f: R \rightarrow R$ defined by $f(x) = 1 + x^2$

CO2-A

2) Find the inverse for the function $f(x) = \frac{3x+2}{x-1}$

CO2-A

3) Determine the value of ceiling function (i) $[3.5]$ (ii) $[-2.4]$ (iii) $[3.143]$

CO2-A

4) If $4,7,10,13,16,19,22, \dots$ Is a sequence find (i) Common difference (ii) n^{th} term (iii) 21^{st} term

CO2-A

5) A pair of dice is tossed twice. Find the Probability of scoring 8 points (a) Once (b) at least once

CO2-A

6) What can be the cases one can expect 10 heads and 6 tails in 256 sets of 16 tosses of a coin?

CO2-A

Q.3) Attempt Any '3' of the following :-

15M

1) Among 100 students, 55 students got distinction in first year 30 get distinction in second year, 15 got distinction in both years. Then how many students got distinction in at least one year.

CO3-A

2) How many ways are there to select a first prize, Second prize and third prize winner from 100? Different people who have enters a contest?

CO3-A

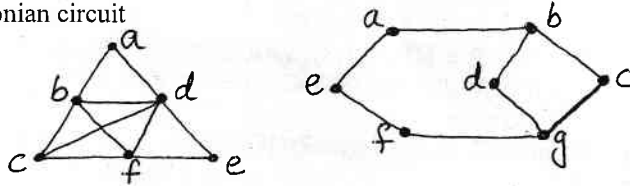
3) Find the co-efficient of $x_1^2 \cdot x_3 \cdot x_4^3 \cdot x_5^3$ in $(x_1 + x_2 + x_3 + x_4 + x_5)^{10}$ also find number of terms

CO3-A

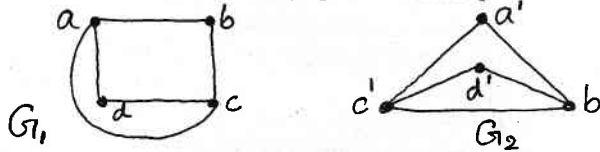
- 4) Find first 4 terms of the sequence defined by the following recurrence relation : $a_n = a_{n-1} + 2a_{n-2}$, and $a_0 = 1, a_1 = 2$ CO3-A
- 5) Solve, $a_{r+2} - a_{r-2} = 0$ CO3-C
- 6) Using back tracking method solve the following recurrence relation, $t_n = 1, n = 0$
 $= 2t_{n-1}$ where $n \geq 1$ CO3-A

Q.4) **Attempt Any '3' of the following :-** 15M

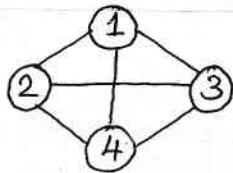
- 1) Show that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$ CO4-R
- 2) Determine which of the following graph contain an Eulerian or Hamiltonian circuit CO4-U



- 3) Determine whether the following graphs are isomorphic or not CO4-U



- 4) Write down the algorithm for depth first search CO4-A
- 5) For the following graph shown in the following. Find the degree of all the nodes and the adjacency matrix for the graph CO4-U



- 6) Write down the algorithm for topological sorting CO4-A

Q.5) **Attempt Any '3' of the following :-** 15M

- 1) Determine the Hasse diagram of the relation R where $A = \{1,2,3,4\}$ $R = \{(1,1)(1,2)(2,2)(2,4)(1,3)(3,3)(3,4)(1,4)(4,4)\}$ CO5-A
- 2) Determine the hasse diagram of the relation on $A = \{1,2,3,4,5\}$ CO5-A

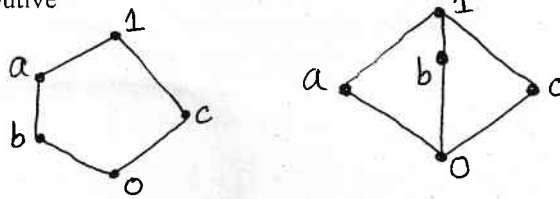
whose matrix is $M_R = \begin{matrix} & \begin{matrix} 1 & 2 & 3 & 4 & 5 \end{matrix} \\ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{matrix} & \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \end{matrix}$

3) Define & explain Greatest element and Least element with 2 examples for each

COS-R

4) Show that the lattices shown in the figure below are non-distributive

COS-A



5) Show that in a bounded distributive lattice, if a complement exists, it is unique.

COS-E

6) Define binary search tree. Write an algorithm for finding duplicates in a list of numbers.

COS-R

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