Total no. of Pages:03 *Roll no.*

III-SEMESTER *B.Tech.(CO)*

END SEMESTER EXAMINATION **Nov- 2022**

CO205 Discrete Structures

Time: 3:00 Hours **Max. Marks: 50**

*Note: Answer **all** questions by selecting **any two** parts from each question. Assume suitable missing data, if any.*

Q.No. 1 **[5x2=10]**

A. ***Test the validity of following argument:*** [CO#1]

Babies are illogical
Nobody is despised who can manage crocodile
Illogical persons are despised
Therefore, babies cannot manage crocodiles.

B. Show that the argument form with premises $(p \wedge t) \rightarrow (r \vee s)$, $q \rightarrow (u \wedge \tilde{t})$, $u \rightarrow p$, and $\sim s$ lead to the conclusion $q \rightarrow r$. [CO#1]

C. Prove that the equation a= (P => (Q=>R)) =>((P =>Q)=>(P=>R)) is a tautology and also Convert the statement α= (¬P V ¬Q)=> (¬P Λ R) into PDNF form. [CO#1]

Q.No. 2 **[5x2=10]**

A. Prove that $7^{2n}+2^{3n-3}.3^{n-1}$ is divisible by 25 for n € N using mathematical induction. [CO#2]

B. Solve recurrence relation $a_n+2a_{n-1}+4a_{n-2}=0$(when roots are complex numbers). [CO#2]

C. What is pigeon hole principle? If seven colors are used to paint 60 cars, then show that at least 8 cars will be of same color and also find in how many ways can 7 women and 6 children stand in a line such that no two children are next to each other. [CO#2]

Q.No. 3 **[5x2=10]**

A. Let $A = \{2, 3, 6, 12\}$ and let *R and S* be relations on A defined by *aRb if and only if* 2 *divides* $(a - b)$ *aSb if and only if* 3 *divides* $(a - b)$ [CO#5]

i. *Determine* $\bar{S}$, $R \cap S$ *and* R^{-1}.

ii. *Write a program to compute symmetric closure of a relation*

B. What are the necessary condition for Permutation of functions? Given following permutation functions F and G. [CO#3]

$$F=\begin{bmatrix}15 & 10 & 20 & 6 & 4\\ 10 & 6 & 4 & 15 & 20\end{bmatrix} \qquad G=\begin{bmatrix}15 & 10 & 20 & 6 & 4\\ 6 & 15 & 10 & 20 & 4\end{bmatrix}$$

Find FoG and GoF.

C. What is Warshalls's Algorithm? Consider the relation R={(1,3),(2,1),(2,4),(4,3)}. Find the transitive closure of R using Warshalls's Algorithm. [CO#6]

Q.No. 4 **[5x2=10]**

A. Is the poset $A = \{1, 2, 3, 6, 12, 24, 36, 72\}$ under the relation of divisibility a lattice? Find the complement of each element of the poset A, if it exists. [CO#3]

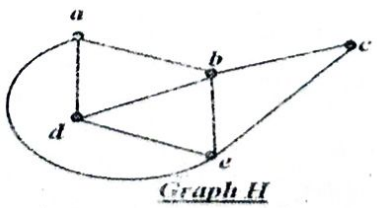
B. Write a program to find the minimum and maximum of a sequence using divide and conquer algorithm. [CO#5]

C. Let D_{40}={1,2,4,5,10,20,40} with relation x<=y if and only if x divides y Find: [CO#3]

i. All Lower and Upper Bound of 10 and 20.
ii. GLB and LB of 10 and 20.
iii. Draw Hasse Diagram of D_{40}.

Q.No. 5 **[5x2=10]**

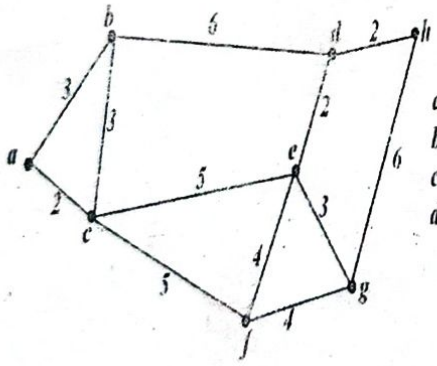
A. For the graph H shown in figure below, find the chromatic polynomial, P_H; and use P_H to find the chromatic number of the graph, $X(H)$. [CO#4]



Graph H

B. Draw the digraphs of the possible spanning trees for the symmetric relation whose graph is given below. How many spanning trees are there? [CO#4]

C. The representative weighted-graph of the footpath connectivity between the important departments, laboratories and other facilities of a University is shown in figure below. The weights mentioned against the edges represent the distance in multiples of 100 meters. The administrative authority of the University plans to upgrade these footpaths to cycling-tracks by creating concrete paths along the route. In Phase-I of this project, it is intended to connect all important departments, laboratories and other facilities using at-least one cycling-track, such that it is feasible to travel from the headquarter to any location using a bicycle. Find a minimal spanning tree whose vertices are the important departments, laboratories and other facilities of the University. What is the total distance for the tree? [CO#6]



Legend

a - Headquarters	e-Academic Block 2
b- Library	f- Sports Arena
c- Computer Centre	g- Girls Hostel
d-Academic Block 1	h-Boys Hostel