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## CS/CT/CO/CI/IT-302-CBGS

### B.Tech., III Semester

Examination, June 2020

## Choice Based Grading System (CBGS)

### Discrete Structures

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

iii) All parts of each question to be attempted at one place.

iv) In case of any doubt or dispute the English version question should be treated as final.

1. a) If  $U$  is a universal set and its two subsets  $A$  and  $B$ , then prove that  $(A \cup B)' = A' \cap B'$

$\forall \{x \in U\}$  universal set

$\text{gm}\{\sim \forall (x \in A) \Rightarrow x \in B\} \Leftrightarrow A \cap B$

b) If  $A = \{1, 4\}$ ,  $B = \{4, 5\}$ ,  $C = \{5, 7\}$ , determine

$A \setminus B$ ,  $A \cap B$ ,  $C \setminus A$

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2. a) Prove by mathematical induction- 7

$$\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \dots + \frac{1}{(2n-1)(2n+1)} = \frac{n}{2n+1}$$

- b) Define Semi group. Prove that every sub group of a cyclic group G is cyclic. 7

3. a) Show that the rule of hypothetical syllogism is valid. 7

$$\begin{aligned} \hat{q} &\rightarrow \hat{r} \\ p &\rightarrow r \end{aligned}$$

- b) Prove that the proposition is a tautology. 7

$$(p \vee \sim q) \wedge (\sim p \vee \sim q) \vee q$$

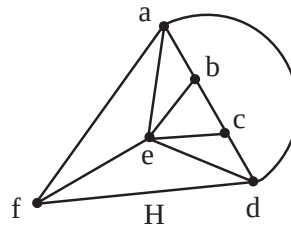
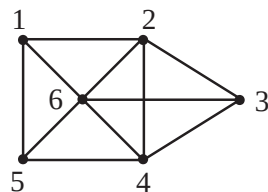
4. a) Test the validity of argument : 7

If it rains, Ram will be sick

It did not rain

∴ Ram was not sick

- b) Prove that G and H are Isomorphic 7

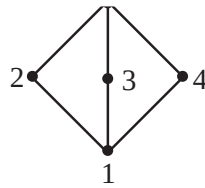


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5. a) Let  $L = \{1, 2, 3, 4\}$  be the lattice shown below. Find all sub lattices with three or more elements. 7



- b) Define the followings with examples: 7

- i) Multi graph                      ii) Isomorphic graph  
iii) Eulerian graph

- i)  $\ll$                                       ii) Isomorphic  $\ll m'$   
iii) Eulerian  $\ll m'$

6. a) Let  $A = \{a, b, c, d\}$  and  $P(A)$  its power set. Draw Hasse diagram of  $(P(A), \subseteq)$ . 7

- b) Determine the discrete numeric function corresponding

to the generating function  $A(z) = \frac{(1+z)^2}{(1+z)^4}$ . 7

$$A(z) = \frac{(1+z)^2}{(1+z)^4}$$

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7. a) What is Graph coloring? Define chromatic number give any one example to explain your answer. 7

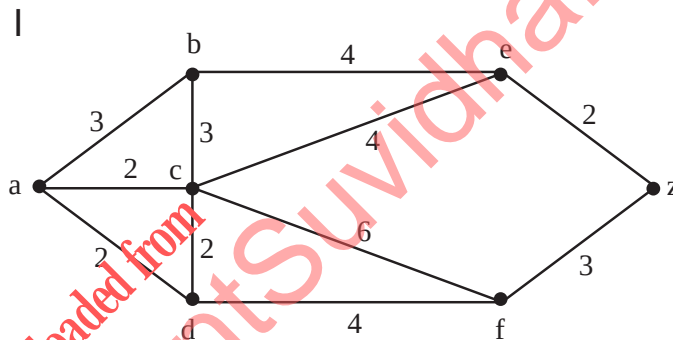
b) Solve the recurrence relation :

$$a_r - 7a_{r-1} + 10a_{r-2} = 0 \text{ given } a_0 = 0 \text{ and } a_1 = 6. \quad 7$$

recurrence relation

$$a_r - 7a_{r-1} + 10a_{r-2} = 0 \text{ given } a_0 = 0 \text{ and } a_1 = 6.$$

8. a) Find the shortest path between  $a$  and  $z$  in the graph shown below. 7



b) Write short notes. 7

- i) Posets
- ii) Lattices
- iii) Permutation and combination

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