

Hall Ticket Number:

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18CSIT 303

II/IV B.Tech (Regular / Supplementary) DEGREE EXAMINATION

February, 2021

Third Semester

Time: Three Hours

Common to CSE & IT

Discrete Mathematical Structures

Maximum: 50 Marks

Answer ALL Questions from PART-A.

Answer ANY FOUR questions from PART-B.

(1X10 = 10 Marks)

(4X10=40 Marks)

Part-A

1. Answer all questions

- Let $A = \{1, 2, 3\}$. List power set of A.
- State Demorgan's Laws?
- Define one to one function and give one example.
- State transitive rule.
- State principle of mathematical induction.
- Symbolize the sentence "all birds can fly".
- Define recurrence relations.
- Draw wheel graph W_6 .
- Define indegree and outdegree with an example
- Define isolated vertex.

(1X10=10 Marks)

Part-B

2. a) In a survey of 800 voters, the following information was found: 300 were college educated, 260 were from high-income families, 325 were registered Democrats, 184 were college educated and from high-income families, 155 were college educated and registered Democrats, 165 were from high-income families and were registered Democrats, 94 were college educated, from high-income Families, and were registered Democrats. Let

$E = \{\text{voters who were college educated}\}$

$I = \{\text{voters who were from high-income families}\}$

$D = \{\text{voters who were registered Democrats}\}$.

Draw a Venn diagram and list the number of elements in the 8 different regions of the diagram.

5M

- b) Using Warshall's algorithm, compute the adjacency matrix of the transitive closure of the digraph $G = \{a, b, c, d, e\}, \{(a, b), (b, c), (c, d), (d, e), (e, d)\}$

5M

3. a) Draw a poset diagram for the poset $[D_{30}; |]$ and determine all maximal and minimal elements and greatest and least elements if they exist. Specify whether the poset is lattice.

5M

- b) Let R be the relation from $A = \{1, 2, 3, 4, 5\}$ to $B = \{1, 3, 5\}$ which is defined by "x is less than y" Write R as a set of ordered pairs. Give complement of R . Draw the diagram for R and complement of R . Give adjacency matrix for R .

5M

4. a) Prove the validity of the following argument.

$$\sim r \rightarrow (s \rightarrow \sim t)$$

$$\sim r \vee w$$

$$\sim p \rightarrow s$$

$$\sim w$$

$$\therefore t \rightarrow p$$

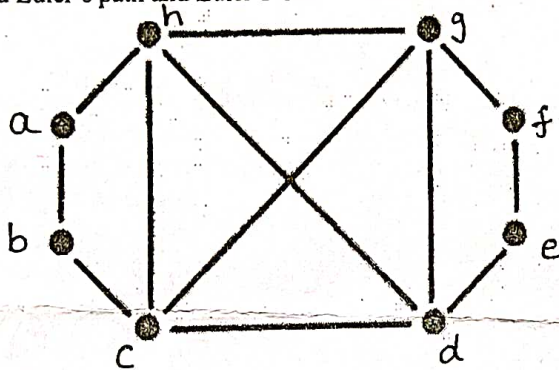
5M

- b) Suppose that a man hiked 6 miles the first hour and 4 miles the twelfth hour and hiked a total of 71 miles in 12 hours. Prove that he must have hiked at least 12 miles within a certain period of two consecutive hours.(proof by contradiction)

5M

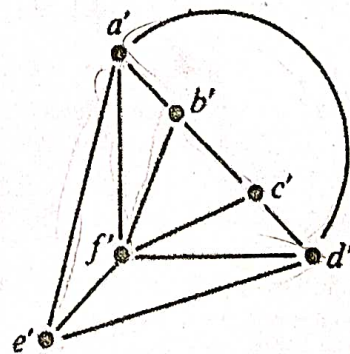
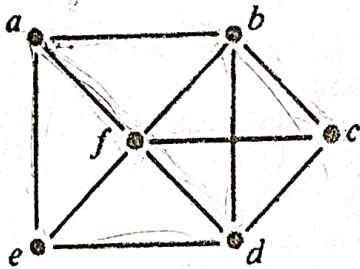
PTO

5. a) Symbolise the following argument and prove that the argument is valid. 5M
 Every living thing is a plant or an animal.
 David's dog is alive and it is not a plant.
 All animals have hearts.
 Hence, David's dog has a heart.
- b) Prove by mathematical induction that $6^{n+2} + 7^{2n+1}$ is divisible by 43 for each positive integer n . 5M
6. a) How many possible telephone numbers are there when there are seven digits, the first two of which are between 2 and 9 inclusive, the third digit between 1 and 9 inclusive, and each of the remaining may be between 0 and 9 inclusive? 5M
- b) How many integral solutions are there to $x_1 + x_2 + x_3 + x_4 + x_5 = 20$ where $x_1 \geq -3$, $x_2 \geq 0$, $x_3 \geq 4$, $x_4 \geq 2$, $x_5 \geq 2$? 4M
7. a) Solve the recurrence relation $a_n = a_{n-1} + n3^n$ where $a_0 = 1$ by using substitution method. 4M
- b) Solve the recurrence relation $a_n - 7a_{n-1} + 12a_{n-2} = 0$ for $n \geq 2$ where $a_0 = 2$ and $a_1 = 5$ by using method of characteristic roots. 6M
8. a) Prove that every simple planar graph is 5-colourable. 6M
- b) Find Euler's path and Euler's Circuit if exists in the following graph.



4M

9. Check whether the following graphs are isomorphic.



10M