VR20 Reg. No: 208W1A1299

VELAGAPUDI RAMAKRISHNA

SIDDHARTHA ENGINEERING COLLEGE

(AUTONOMOUS)

II/IV B.Tech. DEGREE EXAMINATION, March, 2022

Third Semester

20ES3102D DISCRETE MATHEMATICAL STRUCTURES

(IT)

Time: 3 hours ***Max. Marks: 70***

Part-A is compulsory

Answer One Question from each Unit of Part - B

Answer to any single question or its part shall be written at one place only

PART-A

10 x 1 = 10M

1. a. Write the negation of the statement "I went to my class yesterday".

   b. State Pigeonhole principle.

   c. How many different bit strings are there of length 7?

   d. 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.

   e. Define equivalence relation.

   f. Define a group and give an example.

   g. State Lagrange's theorem.

   h. Define complete graph.

   i. How many vertices are needed to construct a graph with 16 edges in which each vertex is of degree 2.

   j. Define chromatic number.

PART-B

4 x 15 = 60M

UNIT-I

2. a. Construct the truth table for the following proposition $[(p \vee q) \wedge (\sim r)] \leftrightarrow q$. **8M**

   b. Test the validity of the following argument. **7M**
   Some rational numbers are powers of 3.
   All integers are rational numbers.
   Therefore, some integers are powers of 3.

(or)

3. a. How many integral solutions are there to **8M**
   $x_1 + x_2 + x_3 + x_4 + x_5 = 20$ where $x_1 \geq 3$, $x_2 \geq 2$, $x_3 \geq 4$, $x_4 \geq 6$ and $x_5 \geq 0$.

   b. Find the coefficient of X^{14} in $(1 + X + X^2 + X^3)^{10}$. **7M**

UNIT-II

4. a. Find the solution to the recurrence relation **7M**
   $$a_n - 3a_{n-1} + 3a_{n-2} - a_{n-3} = 0 \text{ for } n \geq 3.$$

   b. Solve the recurrence relation **8M**
   $$a_n - 6a_{n-1} + 8a_{n-2} = 3^n \text{ for } n \geq 2, \text{ where } a_0 = 3 \text{ and } a_1 = 7.$$

(or)

5. a. Let A be the set of rational numbers. For $a, b \in A$, define $(a, b) \in R$ if $a - b$ is an integer. Prove that R is an equivalence relation on A. **8M**

b. Draw a poset diagram and determine all maximal and minimal elements of $[D_{20}; /]$. **7M**

UNIT-III

6. a. Let $(G,*)$ be a group. Then the following hold good: **7M**
i) $(a^{-1})^{-1} = a$ ii) $(a * b)^{-1} = b^{-1} * a^{-1}$ for all a, b in G.

b. The necessary and sufficient condition for a non-empty set H of a group $(G,*)$ to be a subgroup is $a \in H, b \in H \Rightarrow a * b^{-1} \in H$, where b^{-1} is the inverse of b in G. **8M**

(or)

7. a. Show that any subgroup of a cyclic group $(G,*)$ is cyclic. **7M**

b. Let G be a group of real numbers under addition and G' be the group of positive real numbers under multiplication. Show that the mapping $f: G \rightarrow G'$ defined by $f(x) = 2^x$ is a homorphism. **8M**

UNIT-IV

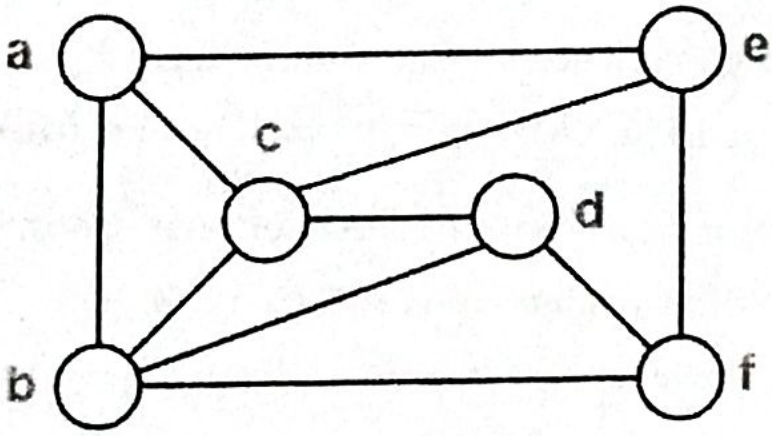
8. a. Explain isomorphism of two graphs. Give examples of isomorphic and non isomorphic graphs. **8M**

b. If G is a connected graph then show that $|V| - |E| + |R| = 2$, where $|V|$ denotes the number of vertices of G, $|E|$ denotes the number of edges of G and $|R|$ denotes the number of regions of G. **7M**

(or)

9. a. Usê Grinberg's theorem to show that there is no planar Hamiltonian graphs with regions of degree 5, 8 and 9 with exactly one region of degree 9. **8M**

b. Find the chromatic number of the graph. **7M**



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