

Code No.: CS305PC

R20

H.T.No.

8

R

CMR ENGINEERING COLLEGE: HYDERABAD  
UGC AUTONOMOUS

II-B. TECH-I-Semester End Examinations (Regular) - February- 2023  
DISCRETE MATHEMATICS  
(Common to CSE, IT & CSM)

[Time: 3 Hours]

[Max. Marks: 70]

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 20 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART-A**

(20 Marks)

1. a) Explain Connectives with suitable example. [2M]
- b) Provide a proof by direct method of the following statement. "If x is odd then  $x^2$  is odd". [2M]
- c) Determine for which constant a, b, c and d it is true that  $f \circ g = g \circ f$ , if  $f(x) = ax + b$  and  $g(x) = cx + d$ , where a, b, c and d are constants. [2M]
- d) If A and B are sets. [2M]  
Then prove that  $\overline{A \cup B} = \bar{A} \cap \bar{B}$ .
- e) Describe the characteristics of the algorithm. [2M]
- f) Define sorting. [2M]
- g) Write the applications of inclusion-exclusion principal. [2M]
- h) Prove that  $V(X) = E((X - \mu)^2)$ . [2M]
- i) Define complete graph and wheel graph. [2M]
- j) If G is a K regular graph with 18 edges and the order of the graph is 9. Find the value of K. [2M]

**PART-B**

(50 Marks)

- 2.a) Prove or disprove the validity of the following arguments using the rules of inference, Sagar does not have driving license or his new car is out of fuel. Sagar have driving license or he does not like to drive his new car. Sagar's new car is not out of fuel or he does not like to drive his new car. Sagar does not lie to drive his new car. [5M]
- b) Prove that all integers are rational numbers. Some integers are powers of 2. Therefore, some rational numbers are powers of 2. [5M]

OR

3. Obtain PCNF and PDNF for the formula [10M]  
 $(\neg p \rightarrow r) \wedge (q \leftrightarrow p)$

4. Define the terms: POSET and Hasse diagram and give one example. [10M]

OR

5. Check for each of these relations on the set  $\{1, 2, 3, 4\}$ , whether it is equivalence or not. Also check antisymmetric. [10M]
6. Use mathematical induction to prove that  $7^{n+2} + 8^{2n+1}$  is divisible by 57 for every nonnegative integer n. [10M]

OR

7. Apply the strong induction to prove "every positive integer greater than 1 can be written uniquely as a prime or as the product of two or more primes where the prime factor are written in order of nondecreasing size". [10M]

8. In a certain town 40% have brown hair, 25% have brown eyes and 15% have both brown hair & brown eyes. A person is selected random from the town
- if he has brown hair, what is the probabilities that he has brown eyes.
  - How many people in town have neither brown hair nor brown eyes?

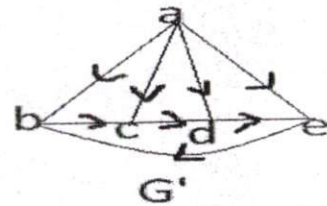
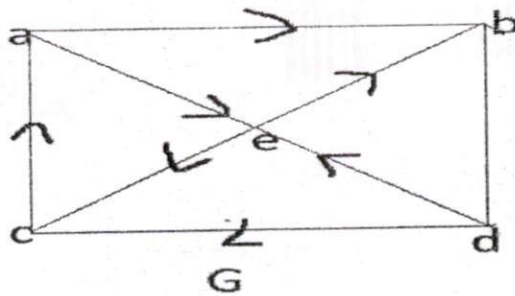
OR

9. Solve the recurrence relation  $a_n - 7a_{n-1} + 16a_{n-2} - 12a_{n-3} = 0$  for  $n \geq 3$  with initial conditions  $a_0=1, a_1=4$  and  $a_2=8$ . [10M]

- 10.a) Define Hamiltonian graph and give one example. [5M]  
 b) Prove that every connected graph has a spanning tree. [5M]

OR

11. Check whether the given graphs are isomorphic or not [10M]



\*\*\*\*\*