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Reg. No. | | | | | | | | |

I Semester M.C.A. Degree Examination, June/July - 2024

COMPUTER SCIENCE

Discrete Mathematics

(CBCS Scheme Y2K20)

Paper : 1MCA2

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates :

1. Answer any **Five** questions from Part - A.
2. Answer any **Four** questions from Part - B.

PART - A

Answer any FIVE of the following questions. Each carries 6 marks. **(5×6=30)**

1. Explain any three operations on sets with example.
2. Write Converse, Inverse and Contrapositive of the following statement:

   "If 2 is not a prime number then It is even number".

3. Prove by mathematical induction that $1^3 + 2^3 + 3^3 + \ldots\ldots + n^3 = \frac{n^2(n+1)^2}{4}$
4. Find the number of arrangements of the letters of the word INDEPENDENCE. In how many of these arrangements,

   (a) Do the words start with P.

   (b) Do all the vowels always occur together.

5. Let $A = \{1,2,3,4,6\}$ and R be the relation on A defined by aRb if a divides b.

   a) Write the relation R in Roster form.

   b) Determine the relation matrix of R

   c) Construct the directed graph that is associated with R.

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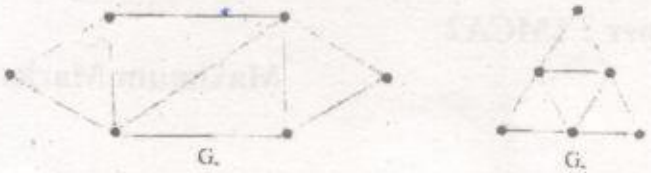
6. Let a pair of dice be thrown and the random variable X be the sum of the numbers that appear on the two dice. Find the mean, variance and standard deviation of X.

7. Explain different tree traversals with example.

8. Examine whether the following graphs are isomorphic or not



PART - B

Answer any FOUR questions. Each carries 10 marks. **(4×10=40)**

9. (a) For any three sets A, B, C Prove that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ using venn diagram.

   (b) A college awarded 38 medals in football, 15 in basketball and 20 in cricket. If these medals went to a total of 58 men and only three men got medals in all the three sports, how many received medals in exactly two of the three sports? **(5+5)**

10. (a) Let $f : N \to Y$ be a function defined as $f(x) = 4x + 3$, where Y is range of f. Show that f is invertible. Find the inverse of f.

    (b) A Committee of eight is to be formed from 16 men and 10 women. In how many ways can the committee be formed if.

    i) There must be 4 men and 4 women.

    ii) There should be an even number of women. **(5+5)**

11. (a) Find the middle terms in the expansion $\left(\frac{x}{3} + 9y\right)^{10}$.

    (b) Explain recurrence relation with example of Fibonacci numbers. **(5+5)**

12. (a) Show that the compound proposition $(p \to q) \leftrightarrow [(\neg p \vee q) \to (q \wedge \neg r)]$ is tautology.

    (b) If P(A) = 6/11, P(B) = 5/11 and P(A∪B) = 7/11 find

    (i) P(A∩B) (ii) P(A/B) (iii) P(B/A) **(5+5)**

13. (a) An insurance Company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident are 0.01, 0.03 and 0.05 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter drive?

(b) If a fair coin is tossed 10 times, find the probability of

(i) Exactly six heads (ii) Atleast six heads (iii) At most six heads. **(5+5)**

14. (a) Define Euler and Hamiltonian graph. Give an example of a graph which is Hamiltonian but not Eulerian and Vice Versa.

(b) Find the minimum cost spanning tree by Kruskal's algorithm. **(5+5)**