Reg. No. ☐☐☐☐☐☐☐

I Semester M.C.A. Degree Examination, July - 2022
COMPUTER SCIENCE
Discrete Mathematics
(CBCS Scheme)
Paper : 1MCA2

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

Instruction to Candidates:

> Answer any **5** questions from Part A, any **4** questions from Part-B.

PART - A

Answer any **Five** questions. Each carries **Six** marks.   **(5×6=30)**

1. a) Determine the sets A and B, given that $A - B = \{1,2,4\}$, $B - A = \{7,8\}$ and $A \cup B = \{1,2,4,5,7,8,9\}$

   b) For any three sets A,B,C prove that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

2. Let $A = \{1,2,3,4,6\}$. Define a relation R on set A defined by $R = \{(a,b) : a,b \in A " a \leq b"\}$.

   i) Write down elements of R

   ii) Matrix representation of R and

   iii) Digraph of R

3. Prove by Mathematical Induction $1^2 + 2^2 + 3^2 + \ldots\ldots\ldots + n^2 = \dfrac{n(n+1)(2n+1)}{6}$ for all positive integers 'n'.

4. Prove that the proposition $[p \to (q \to r)] \leftrightarrow [(p \to q) \to (p \to r)]$ is a tautology.

5. How many ways can the letters of the word ASSASSINATION be arranged so that all the S's are together?

[P.T.O.

6. If $P(A)=0.8$, $P(B)=0.5$, $P(B/A)=0.4$ then find

   i) $P(A \cap B)$

   ii) $P(A/B)$

   iii) $P(A \cup B)$

7. Find the coefficient of $x^9 y^3$ in the expansion of $(2x-3y)^{12}$

8. Define the following with an example.

   a) Pseudo graph

   b) Complete graph

   c) Planar graph

PART - B

Answer any **Four** questions. Each carries **Ten** marks. $(4 \times 10 = 40)$

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. (4)

   b) In a class consisting of 120 students, 30 are studying C++, 40 are studying Python and 45 are studying Java, 15 studying both C++ and Python, 20 studying both Python and Java, 12 studying both C++ and Java, 8 are studying all the three. How many do not take any of these subjects? How many take only one language? (6)

10. a) Show that $[p \to (q \wedge r)] \equiv [(p \to q) \wedge (p \to r)]$. (5)

    b) Determine the validity of the following argument. Either Anchal will run or Vibha will speak. If Vibha speaks then Abhi will fly and the Rose is purple. The rose is not purple, therefore Anchal will run. (5)

11. a) State and prove Pigeonhole principle. (5)

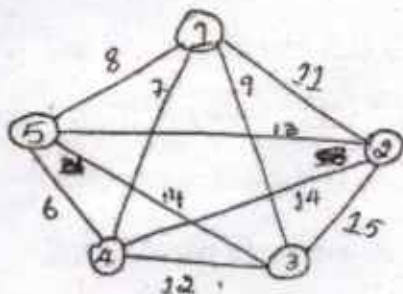   b) Solve recurrence relation $a_n = 4a_{n-1} + 5a_{n-2}$ with initial conditions $a_1 = 2$ and $a_2 = 6$. (5)

12. a) Define Conditional Probability. (2)

   b) A random variable X has the following probability distribution. (8)

X	0	1	2	3	4	5	6	7
P(X)	0	K	2K	2K	3K	K^2	$2K^2$	$2K^2+K$

   Find :

   i)   K

   ii) $P(x < 3)$

   iii) $P(x > 6)$

   iv) $P(0 < x < 3)$

13. a) Define spanning tree with an example. (4)

   b) Find the minimum weight spanning tree by Prim's Algorithm (6)

14. a) Explain Hamilton path and Hamilton Circuit with examples. (4)

   b) Examine whether the following graphs are isomorphic or not. (6)