62452

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 $R = \{(a,b) : a,b \in A " a \le b"\}$.

    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?

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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.   **(4×10=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)**
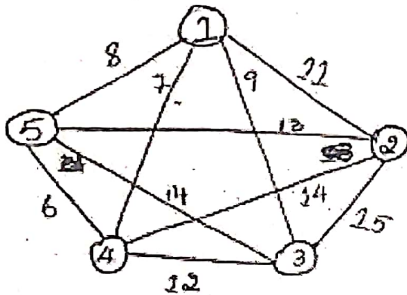
12. a) Define Conditional Probability.   (2)

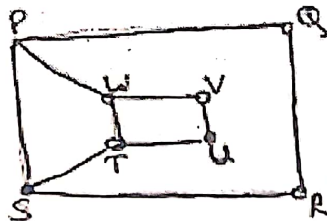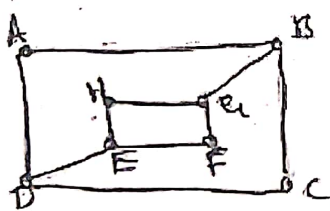**b)** A random variable X has the following probability distribution.   (8)

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

rk

Find :

i)   K
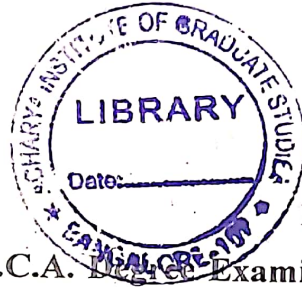
ii) $P(x < 3)$

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)

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(CBCS Y2k20 Scheme)

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Maximum Marks : 70

Instructions to Candidates:

Answer any Five questions from Part - A.

Answer any Four questions from Part - B.

PART - A

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

1. State and Prove De Morgan's Law.

2. Prove by Mathematical Induction that

$$1.2 + 2.3 + 3.4 + \ldots + n.(n+1) = \frac{n(n+1)(n+2)}{3}$$

3. Define Logical Equivalence Show that $(P \leftrightarrow q) \Leftrightarrow (P \to q) \wedge (q \to P)$

4. State and Prove Pigeon - hole Principle.

5. Find relational matrix, digraph indegrees and outdegrees for the relation

   $R = \{(1,3),(2,1),(3,1),(3,4),(4,1),(4,2),(4,5),(5,3)\}$ defined on the set $A = \{1,2,3,4,5\}$

6. IF $P(A) = \frac{6}{11}$, $P(B) = \frac{5}{11}$ and $P(A \cup B) = \frac{7}{11}$ find

   (i) $P(A \cap B)$
   (ii) $P(A / B)$
   (iii) $P(B / A)$

7. Explain different tree traversals with example.

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8.　Define the following terms with example

　　a)　Pseudo graph

　　b)　Complete graph

　　c)　Planar graph

PART - B

Answer any Four questions. Each question carries Ten marks.　(4×10=40)

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

　　b)　A survey of 500 television viewers of a sports channel produced the following information 285 watch cricket, 195 watch hockey, 115 watch football, 45 watch cricket and football, 70 watch cricket and hockey, 50 watch hockey and football and 50 do not watch any of the three games. Find

　　　　i)　How many viewers in the survey watch all three kinds of games?

　　　　ii)　How many viewers watch exactly one of the sports?　　(5+5)

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

　　b)　Find the middle terms in the expansion $\left(\dfrac{x}{3} + 9y\right)^{10}$.　　(5+5)

11.　a)　Consider f: $R_+ \to [4, \infty]$ given by $f(x) = x^2 + 4$. Show that f is invertible and find invense of f.

　　b)　Prove that the compound proposition $[(P \to q) \wedge (q \to r)] \to (P \to r)$ is a Tautology　　(5+5)

12.　a)　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.

　　b)　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 driver?　　(5+5)

13. a) Two cards are drawn from a pack of 52 cards at random. What is the probability that it will be

   i) a diamond and a heart

   ii) a king or a queen

   iii) both are kings.

b) Define Graph. Show that the sum of degrees of all the vertices of a graph is twice the no. of edges. **(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 for the below graph using kruskal's algorithm. **(5+5)**