PG – 666

I Semester M.C.A. (Two Years Course) Examination, May/June 2026
(CBCS Scheme) (2020 – 2021 and Onwards)
COMPUTER SCIENCE
1MCA2 : Discrete Mathematics

Time : 3 Hours Max. Marks : 70

Instructions : *1) Answer **any five** questions from Section – **A**.*
*2) Answer **any four** questions from Section – **B**.*

SECTION – A

Answer **any five** of the following. **Each** question carries **six** marks. **(5×6=30)**

1. a) Determine the sets A and B, given that A–B = {1, 2, 4}, A∩B = {7, 8} and A∪B = {1, 2, 4, 5, 7, 8, 9}.
   b) For any three sets A, B, C prove that A∪(B∩C) = (A∪B)∩(A∪C). **(3+3)**
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
   $1.3 + 2.4 + 3.5 + ... + n(n+2) = \frac{n(n+1)(2n+1)}{6}$.
4. State and prove Pigeon-hole principle.
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 the Roster form.
   b) Determine the relation matrix of R.
   c) Construct the directed graph that is associated with R.
6. 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).

P.T.O.

7. Find the coefficient of x^8y^3 in the expansion of $(2x - 3y)^{12}$.

8. Define the following with an example.

   a) Pseudo graph

   b) Complete graph

   c) Planar graph

SECTION – B

Answer **any four** of the following. **Each** question carries **ten** marks. **(4×10=40)**

9. a) For any three sets A, B, C prove that $A\Delta(B\Delta C) = (A\Delta B)\Delta C$ 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) Show that $[p \rightarrow (q \wedge r)] \equiv [(P \rightarrow q) \wedge (p \rightarrow r)]$.

    b) Consider $f : R \rightarrow [4, \infty]$ given by $f(x) = x^2 + 4$. Show that f is invertible and find inverse of f. **(6+4)**

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

    b) 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 variation of X. **(5+5)**

12. a) Define conditional probability.

    b) In a bolt factory there are four machines A, B, C, D manufacturing respectively 20%, 15%, 25%, 40% of the total production out of these 5%, 4%, 3%, 2% are defective. If a bolt drawn at random was found defective. What is the probability that it was manufactured by A or D ? **(3+7)**

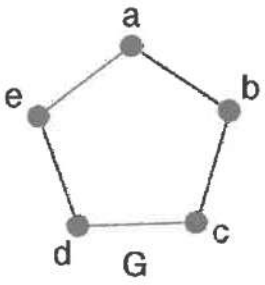
13. a) Two cards are drawn from a pack of 52 cards at random. What is the probability that it will be :

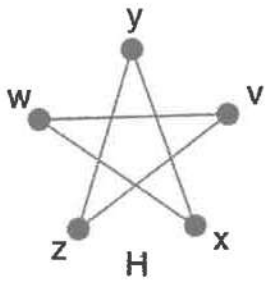
    i) a diamond and a heart

    ii) a king or a queen

    iii) both are kings.

    b) Examine whether the following graphs are isomorphic or not. **(6+4)**





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

    b) Find the minimum cost spanning tree for the below graph using Kruskal's Algorithm. **(5+5)**

