

- (b) (i) Find the number of permutations of the letters of the word "INDEPENDENCE."  
 (ii) Expand  $(98)^3$  using binomial theorem. (CO4)
- (c) What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these? (CO4)
- four cards are of the same suit,
  - four cards belong to four different suits,
  - two are red cards and two are black cards.
5. (a) Define tautology and contradiction. Check whether the preposition :  

$$q \vee [\sim q \wedge r] \wedge \sim q]$$
 is a tautology or a contradiction. (CO5)
- (b) Define logical equivalence. Show that  $\sim(p \vee q)$  and  $\sim p \wedge \sim q$  are logically equivalent. (CO5)
- (c) (i) Obtain the Conjunctive Normal Form (CNF).  

$$[q \vee (p \wedge r)] \wedge \sim [(p \vee r) \wedge q]$$
 (ii) Obtain Disjunctive Normal Form (DNF). (CO5)  

$$p \vee (\sim p \rightarrow (q \vee (q \sim r)))$$

Roll No. ....

**TBI-103****B. SC. (IT) (FIRST SEMESTER)  
END SEMESTER****EXAMINATION, JAN., 2023****MATHEMATICAL FOUNDATION OF  
COMPUTER SCIENCE****Time : Three Hours****Maximum Marks : 100****Note :** (i) All questions are compulsory.(ii) Answer any *two* sub-questions among (a), (b) and (c) in each main question.(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) Find the inverse of matrix : (CO1)

$$A = \begin{bmatrix} 8 & 4 & 2 \\ 2 & 9 & 4 \\ 1 & 2 & 8 \end{bmatrix}$$

(2)

TBI-103

- (b) Use matrix method to solve the following system of equations : (CO1)

$$5x - 7y = 2$$

$$7x - 5y = 3$$

- (c) (i) If the points  $(2, -3)$ ,  $(\lambda, -1)$ ,  $(0, 4)$  are collinear, find the value of  $\lambda$ .

- (ii) Find the area of the triangle with vertices A  $(5, 4)$ , B  $(-2, 4)$  and C  $(2, -6)$ . (CO1)

2. (a) Define pictorial representation of relations with examples. (CO2)

- (b) (i) If  $A = \{12, 13, 14, 15, 16, 17\}$  and  $B = \{7, 8, 9\}$ , then find the values of  $(A - B)$  and  $(B - A)$ ?

- (ii) If  $A = \{a, b\}$  and  $B = \{3, 4\}$ . What is the Cartesian product of two sets  $A \times B$  and  $B \times A$ . Verify whether they are equal or not?

- (iii) Verify De-Morgan's law : (CO2)

$$(A \cup B)' = A' \cap B'$$

using Venn diagrams.

(3)

TBI-103

- (c) (i) Find  $g \circ f$  and  $f \circ g$ , if  $f : \mathbb{R} \rightarrow \mathbb{R}$  and  $g : \mathbb{R} \rightarrow \mathbb{R}$  given by  $f(x) = \cos x$  and  $g(x) = 3x^2$ . Show that  $g \circ f \neq f \circ g$ .

- (ii) Define partially ordered set.

- (iii) Consider set  $A = \{2, 3, 4, 5\}$  and relation  $R = \{(5, 5), (5, 3), (2, 2), (2, 4), (3, 5), (3, 3), (4, 2), (4, 4)\}$ . Show that it is an equivalence relation. (CO2)

3. (a) Solve the recurrence relation :

$$a_n - a_{n-1} - 2a_{n-2} = 0,$$

$n \geq 2$  with initial conditions  $a_0 = 0$ ,  $a_1 = 1$  using method of characteristics roots. (CO3)

- (b) Solve the recurrence relation :

$$a_n = 3a_{n-1} + 7$$

$n \geq 2$  with initial conditions  $a_0 = 5$  using substitution method. (CO3)

- (c) Prove using mathematical induction that for all  $n \geq 1$  : (CO3)

$$1 + 4 + 7 + \dots + (3n - 2) = \frac{n(3n - 1)}{2}$$

4. (a) Determine  $n$  if  ${}^2nC : {}^nC = 12 : 1$ . (CO4)

P. T. O.