

MATHEMATICAL FOUNDATION FOR COMPUTER  
SCIENCE

Paper–BCA-CTIS-104

Time : Three Hours]

[Maximum Marks : 60

**Note :** Attempt *five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory.

**Compulsory Question**

1. (a) If  $A = \{2, 4, 6, 8, 10\}$   
 $B = \{1, 2, 3, 4, 5, 6, 7\}$   
 $C = \{2, 6, 7, 10\}$  and  $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$   
then verify that  $A \cup (B \cap C) = (A \cup B) \cap C$ . 3
- (b) If A and B are Hermitian matrices show that  $AB - BA$  is Skew-Hermitian. 3
- (c) Define array and frequency. Give *one* example of each. 3
- (d) Find the probability distribution of the number of heads in three tosses of a coin. 3

**UNIT-I**

2. (a) If R is an equivalence relation on a set A, show that  $R^{-1}$  is also an equivalence relation.
- (b) Let A be any set. Show that if C is a partial order on A then ' $<$ ' is a strict partial ordering relation on A. 6,6

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3. (a) Define contradiction and tautology propositions. Use truth table to establish contradiction and tautology from the following properties :
- (i)  $[(\sim q \vee p) \wedge q]$
  - (ii)  $[p \wedge (\sim q)] \vee [(\sim p) \vee q]$ .
- (b) If  $W_1$  and  $W_2$  are two sub-spaces of a finite dimension vector space  $V(F)$  then
- $$\dim(W_1 + W_2) = \dim W_1 + \dim W_2 - \dim (W_1 \cap W_2).$$
- 6,6

**UNIT-II**

4. (a) Solve the system of equations :
- $$\begin{aligned} 2x + 8y + 5z &= 5x \\ + y + z &= -2x \\ + 2y - z &= 2. \end{aligned}$$
- (b) Find eigen value and eigen vectors of matrix

$$A = \begin{pmatrix} 1 & 0 & 1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{pmatrix}.$$

6,6

5. (a) Define following terms with the help of example :
- (i) Sub graph.
  - (ii) Planar graph.
  - (iii) Hamilton path.
  - (iv) Graph isomorphism.
- (b) State and prove Euler's formula for connected planar graph.
- 6,6

**UNIT-III**

6. (a) The average weight of 150 students in a class is 80 kg. The average weight of boys in the class is 85 kg and that of girls is 70 kg. Find the numbers of boys and girls in the class separately.

- (b) Calculate Median and Mode of the data given below :

Marks	10	20	30	40	50	60
No. of students	8	23	45	65	75	80

6,6

7. (a) Find the range, coeff. of range and quartile deviation from the following data :

Class	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	3	5	15	10	4	2

- (b) Calculate mean deviation and its co-efficient for the following distribution :

Marks	0-10	10-20	20-30	30-40	40-50
No. of students	5	8	15	16	6

6,6

**UNIT-IV**

8. (a) Two unbiased dice are thrown together at random. What is the expected value of sum of the numbers shown by the two dice ?
- (b) A die is thrown 6 times. Getting an odd number is a success. What is the probability of :
- (i) 5 successes

(ii) Atleast 5 successes

(iii) Atmost 5 successes.

6,6

**9.** (a) State and prove Baye's theorem on probability.

(b) From a lot of 10 items containing 3 defective items, a sample of 4 items is drawn at random. Let the random variable  $X$  denote the number of defective items in the sample. If the sample is drawn without replacement, find the mean and variance of  $X$ . 6,6

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