Exam. Code : 105701
Subject Code : 1529

B.Sc. (IT) Semester—I

BASIC MATHEMATICS & STATISTICS

Paper—III

Time Allowed—3 Hours] [Maximum Marks—75

Note :— (1) Attempt any **FIVE** questions. All questions carry equal marks.

(2) Only Non-programmable and Non-storage type calculator is allowed.

1. (a) In a group of 50 persons, 14 drink tea but not coffee and 30 drink tea. Find :

(i) How many drink both tea and coffee ?

(ii) How many drink coffee but not tea ?

(b) If A = {1, 2, 3, 4, 5}, B = {1, 3, 5, 7, 9} and C = {2, 3, 4}, then verify that :

$$A - (B \cup C) = (A - B) \cap (A - C).$$

2. (a) Prove that $A \subseteq B$ if and only if $B^c \subseteq A^c$ for all sets A, B.

(b) Let A = {2, 4, 6, 8}, B = {2, 3, 5, 7} and U = {1, 2, 3, 4, 5, 6, 7, 8, 9}, then verify that :

(i) $(A \cup B)^c = A^c \cap B^c$ and

(ii) $(A \cap B)^c = A^c \cup B^c$

3. (a) Let A = {1, 2, 3, 4, 5}, B = {2, 4, 6, 8, 10} and the relation from A into B defined by R = {(a, b) : a ∈ A, b ∈ B, a divides b}. Then find R and show that domain of R is A and range of R is B.

(b) Differentiate $\left(2x^2+3\right)^{\frac{5}{3}}(x+5)^{-\frac{1}{3}}$ with respect to x.

4. (a) If $y=\sqrt{\log x+\sqrt{\log x+\sqrt{\log x+\ldots\infty}}}$, then prove that $(2y-1)\dfrac{dy}{dx}=\dfrac{1}{x}$.

(b) If $y = x^x + (\sin x)^x$, then find $\dfrac{dy}{dx}$.

5. (a) Evaluate $\int \dfrac{x^2}{\sqrt{x-1}}\,dx$.

(b) Find $\int \dfrac{dx}{5+4\sin x}$.

6. (a) A bag contains 8 white and 4 red balls. Five balls are drawn at random. What is the probability that 2 of them are red and 3 white ?

(b) If for two events A and B, $P(A)=\dfrac{1}{3}$, $P(B)=\dfrac{3}{4}$ and A ∪ B = S (sample space) then find the conditional probability P(A|B).

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7. (a) A and B throw a die alternatively till one of them gets a six and wins the game. Find the probability of winning of B if A starts the game.

(b) If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, then $A^n = \begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$ where n is a positive integer.

8. (a) Using matrix method to solve the following system of linear equations :

$$x + y + z = 6$$
$$x + 2z = 7$$
$$3x + y + z = 12$$

(b) Verify Cayley-Hamilton theorem for :

$$A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & 1 \\ 1 & -1 & 2 \end{bmatrix}.$$