B.Sc. Information Technology 1ˢᵗ Semester

(Old Sylb 2016)

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) U = [1,2,3,4,5,6,7,8,9] A = [1,2,3,4]
   B= [2,4,6,8] C = [3,4,5,6]

   Find :

   (i) $(B - C)'$

   (ii) $(A \cap C)'$

   (iii) $(A \cup B)'$

   (b) Let U = [1,2,3,4,5,6] A = [2,3] B = [3,4,5]. Find A^c, B^c, $A^c \cap B^c$, A $\cup$ B and hence show that $(A \cup B)^c = A^c \cap B^c$.

2. (a) In a group of 50 people, 35 speak Hindi, 25 speak both Hindi and English and all the people speak at least one of two languages. How many people speak only English and not Hindi ? How many speak English ?

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(b) Let A = [1,2] B = [3,4]. Find number of relation from A into B.

3. (a) Let R be relation on set N of Natural numbers defined by a + 3b = 12

Find :

(i) R

(ii) Domain of R

(iii) Range of R

(b) If $Y = X^Y$, prove that : $\dfrac{dy}{dx} = \dfrac{Y^2}{X(1 - Y\,LOG\,X)}$.

4. (a) $Y = \sin^2 x/(1 + \cos^2 x)$ find dy/dx.

(b) $(\sin x)^y = (\sin y)^x$ find dy/dx.

5. (a) Evaluate $\int x.\log x\,dx$.

(b) Evaluate $\int_1^2 e^x \left(\dfrac{1}{x} - \dfrac{1}{x^2}\right) dx$.

6. (a) An urn contains 5 red and 5 black balls. A ball is drawn at random, its color is noted and returned to urn ; moreover 2 additional balls of color are drawn and put in the urn and then a ball is drawn at random. What is probability then second ball is red ?

(b) If P(E) = 3/5 P(F) = 3/10 P(E ∩ F) = 1/5, are E and F independent ?

7. (a) $A = \begin{bmatrix} 5 & 0 & 4 \\ 2 & 3 & 2 \\ 1 & 2 & 1 \end{bmatrix}$ find its inverse.

(b) Prove that :

$$\begin{bmatrix} 1 & 1 & 1 \\ \alpha & \beta & \gamma \\ \beta\gamma & \gamma\alpha & \alpha\beta \end{bmatrix} = (\alpha - \beta)(\beta - \gamma)(\gamma - \alpha)$$

8. (a) Verify Cayley Hamilton theorem $A = \begin{bmatrix} 3 & 2 & 4 \\ 4 & 3 & 2 \\ 2 & 4 & 3 \end{bmatrix}$.

(b) Find eigen value of matrix $A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$.