BUSINESS MATHEMATICS-I

Time : Three Hours Maximum Marks :

[Regular Candidates : 80, Reappear Candidates 90]

Note : Attempt ***five*** questions inall. Question No. 1 is compulsory. All questions carry equal marks :

1. (a) If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ 3

$A = \{1, 2, 3\}$, $B = \{2, 4, 5, 8\}$

find (i) A' (ii) $(A \cap B)'$ (iii) $(A \cup B)'$

(b) If one root of equation $3x^2 - 9x + b = 0$ exceed the other by 2. Find value of b and the roots. 2

(c) Find the term independent of x in $\left(3x + \frac{2}{x}\right)$. 3

(d) Show that :

$f(x) = \begin{cases} \frac{x^2-1}{x-1}, & x \neq 1 \\ 2, & x = 1 \end{cases}$ is continuous at $x = 1$ 3

(e) Solve the equation $2x - 3 = \frac{x}{2} - 2$. 2

(f) Evaluate $^{100}C_{98}$

2. (a) Prove that $A \cup (B \cup C) = (A \cup B) \cup C$ 8

(b) Prove that

$p \wedge (q \vee r) = (p \wedge q) \vee (p \wedge r)$

3. (a) Solve for x, y, z the equations 8

$$\frac{xy}{x+y} = \frac{2}{3}; \frac{yz}{y+z} = \frac{4}{3}; \frac{zx}{z+x} = \frac{4}{5}$$

(b) Solve the equation of $3x^2 - 2x - \sqrt{3x^2 - 2x + 4} = 16$

8

4. (a) In how many ways can the letteres of the word 'UNIVERSAL' be arranged ? In how many of those will E, R, S always occur together ? 8

(b) If P be the sum of odd terms and Q the sum of even terms in the expansion of $(x+a)^n$, prove that $P^2 - Q^2 = (x^2 - a^2)^n$ and $4PQ = (x+a)^{2n} - (x-a)^{2n}$. 8

5. (a) Show that $\lim_{x \to 0} \frac{1 + 2^{\frac{1}{x}}}{3 + 2^{\frac{1}{x}}}$ does not exist. 8

6. (a) If $y = (x - \sqrt{1+x^2})$; prove that $(1 + x^2)\left(\frac{dy}{dx}\right)^2 = y^2$. 8

(b) If $x\sqrt{1+x} + y\sqrt{1+x} = 0$, $x \neq y$ then prove that $\frac{dy}{dx} = \frac{-1}{(1+x)^2}$. 8

7. (a) Show that the rectangle of maximum perimeter which can be inscribed in a circle of radius a ia a square of side $a\sqrt{2}$. 8

(b) If the demand function is $p = \frac{36}{x-36} + 12$, where p is price and x is the quantity. Find maximum revenue. 8

8. (a) Solve the following system of equations, using Cramer's rule. 8

$x + y + z - 7 = 0$

$x + 2y + 3z - 16 = 0$

$x + 3y + 4z = 22$

(b) Find $\vec{A}$, where $A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & 3 & 2 \\ 3 & -3 & -4 \end{bmatrix}$

hence solve the system of linear equations

$x + 2y - 3z = -4$

$2x + 3y + 2x = 2$

$3x - 3y - 4z = 11$ 8