Roll No. ..... Total Pages : 4

BCE/D-20 **26005**

BUSINESS MATHEMATICS–I

Paper–BC-105

Time Allowed : 3 Hours] [Maximum Marks : 80

Note : Attempt **five** questions in all, Question No. 1 is compulsory. Rest questions carry equal marks.

1. (i) Prove that $\log_9 27 - \log_{27} 9 = \frac{5}{6}$. 4

(ii) Find the sum of 20 terms of series : 4

$2 - 4 + 6 - 8 + 10 - 12 + ...$

(iii) Find the second derivative of $\frac{\log x}{x}$. 4

(iv) For what value of x, the given matrix :

$A = \begin{bmatrix} 3-2x & x+1 \\ 2 & 4 \end{bmatrix}$ is a singular matrix? 4

(v) Find the effective rate of interest 6% p.a. compounded continuously. 4

2. (i) If $x = 1 + \log_a bc,\ y = 1 + \log_b ca,\ z = 1 + \log_c ab$, prove that $xyz = xy + yz + zx$. 7½

(ii) Simplify by using log tables :

$$\frac{(17.5)^{1/2}+(15.2)^{-1/3}}{(56.3)^{3/5}-(12.4)^{1/4}}.$$ 7½

3. (i) Find the sum of the series .6+.66+.666+.....to n terms. 7½

(ii) A machine depreciates in values at the rate of 10% every year on reducing balance. If the original cost be ₹ 20,000 and the ultimate scrap value ₹ 13,122, find the effective life of the machine. 7½

4. (i) Differentiate $x^{1/x}+(\log x)^x$ w.r.t. x. 7½

(ii) If $x^p + y^q = (x+y)^{p+q}$, then prove that $\frac{d^2y}{dx^2}=0$. 7½

5. (i) A window is in form of a rectangle surmounted by a semi-circular opening. The total perimeter of the window is 10m. Find the dimensions of the windwo so as to admit maximum light through the whole opening. 7½

(ii) A Sitar manufacturer can still 'x' sitars per week at ₹ 'p' each where $5x = 375 - 3p$. The cost of

production is ₹ $\left[500+13x+\frac{x^2}{5}\right]$. Find how many sitars should be manufactured for maximum profit and what is the Profit? 7½

6. (i) Prove that :

$$\begin{vmatrix} 1 & x & x^3 \\ 1 & y & x^3 \\ 1 & z & x^3 \end{vmatrix} = (x-y)(y-z)(z-x)(x+y+z). \qquad 7½$$

(ii) Express the following matrix as sum of a Symmetric and Skew-symmetric matrix :

$$\begin{bmatrix} 1 & 2 & 4 \\ 6 & 8 & 1 \\ 3 & 5 & 7 \end{bmatrix}. \qquad 7½$$

7. (i) The sum of three numbers is 6. If we multiply the third number by 2 and add the first number to the result, we get 7. By adding second and third numbers to three times the first number, we get 12. Use determinants to find the number. 7½

(ii) Solve the following system of equations : 7½

$$2x+8y+5z=5$$
$$x+y+z=-2$$
$$x+2y-z=2.$$

8. (i) Find the nominal rate of interest when interest is payable half yearly which is equivalent to the effective rate of 6.14% per annum. 7½

(ii) Find the Compound interest on ₹ 6,950 for 3 years if interest is Payable half yearly, the rate of interest for the first two years being 6% p.a. and for the third year 9% p.a. 7½

9. (i) A Colour television worth ₹ 10,000 is Purchased on instalment plan under which 10 equal instalments including interest at 10% per annum are payable. Find the amount of Annual instalment. 7½

(ii) A man borrows ₹ 6,000 at the rate of interest 6% p.a. compounded continuously and promises to pay off the loan in 20 annual instalments. Find the amount of each Annual instalment. 7½