

09107

BACHELOR IN COMPUTER APPLICATIONS

Term-End Examination

June, 2012

BCS-012 : BASIC MATHEMATICS

Time : 3 hours

Maximum Marks : 100

Note : Question no. one is compulsory. Attempt any three questions from four.

1. (a) For what value of 'k' the points (-k+1, 2k), (k, 2-2k) and (-4-k, 6-2k) are collinear. 5

(b) Solve the following system of equations by using Matrix Inverse Method. 5

3x + 4y + 7z = 14

2x - y + 3z = 4

2x + 2y - 3z = 0

(c) Use principle of Mathematical Induction to prove that : 5

1/(1x2) + 1/(2x3) + + 1/(n(n+1)) = n/(n+1)

(d) How many terms of G.P sqrt(3), 3, 3*sqrt(3) _____. 5

Add upto 39 + 13*sqrt(3)

(e) If $y = ae^{mx} + be^{-mx}$ Prove that $\frac{d^2 y}{dx^2} = m^2 y$ 5

(f) Evaluate Integral $\int \frac{x}{(x+1)(2x-1)} dx$. 5

(g) Find the unit vector in the direction of 5

$$\left(\vec{a} - \vec{b} \right) \text{ where } \vec{a} = -\hat{i} + \hat{j} + \hat{k}$$

$$\text{and } \vec{b} = 2\hat{i} + \hat{j} - 3\hat{k}$$

(h) Find the Angle between the lines 5

$$\vec{r} = 2\hat{i} + 3\hat{j} - 4\hat{k} + t \left(\hat{i} - 2\hat{j} + 2\hat{k} \right)$$

$$\vec{r} = 3\hat{i} - 5\hat{k} + s \left(3\hat{i} - 2\hat{j} + 6\hat{k} \right)$$

2. (a) Solve the following system of linear equations using Cramer's Rule → 5

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

$$2x + 4y + z = 7$$

$$3x + 2y + 9z = 14$$

(b) Construct a 2×2 matrix $A = [a_{ij}]_{2 \times 2}$ where 5

$$\text{each element is given by } a_{ij} = \frac{1}{2} (i + 2j)^2$$

- (c) Reduce the Matrix to Normal form by elementary operations. 10

$$A = \begin{bmatrix} 5 & 3 & 8 \\ 0 & 1 & 1 \\ 1 & -1 & 0 \end{bmatrix}$$

3. (a) Find the sum to Infinite Number of terms of A.G.P. 5

$$3 + 5 \left(\frac{1}{4} \right) + 7 \left(\frac{1}{4} \right)^2 + 9 \left(\frac{1}{4} \right)^3 + \text{---}$$

- (b) If $1, \omega, \omega^2$ are Cube Roots of unity show that $(1 + \omega)^2 - (1 + \omega)^3 + \omega^2 = 0$. 5

- (c) If α, β are roots of equation $2x^2 - 3x - 5 = 0$ form a Quadratic equation whose roots are α^2, β^2 . 5

- (d) Solve the inequality $\frac{3}{5} (x - 2) \leq \frac{5}{3} (2 - x)$ 5
and graph the solution set.

4. (a) Evaluate $\lim_{x \rightarrow 3} \frac{x^3 - 27}{x^2 - 9}$ 5

- (b) A spherical ballon is being Inflated at the rate of $900 \text{ cm}^3/\text{sec}$. How fast is the Radius of the ballon Increasing when the Radius is 15 cm. 5

- (c) Evaluate Integral $\int e^x \left[\frac{1}{x} - \frac{1}{x^2} \right] dx$ 5
- (d) Find the area bounded by the curves $x^2 = y$ and $y = x$. 5
5. (a) Find a unit vector perpendicular to both the vectors $\vec{a} = 4\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = -2\hat{i} + \hat{j} - 2\hat{k}$ 5
- (b) Find the shortest distance between the lines $\vec{r} = (3\hat{i} + 4\hat{j} - 2\hat{k}) + t(-\hat{i} + 2\hat{j} + \hat{k})$ and $\vec{r} = (\hat{i} - 7\hat{j} + 2\hat{k}) + t(\hat{i} + 3\hat{j} - 2\hat{k})$ 5
- (c) Suriti wants to Invest at most ₹ 12000 in saving certificates and National Saving Bonds. She has to Invest at least ₹ 2000 in Saving certificates and at least ₹ 4000 in National Saving Bonds. If Rate of Interest on Saving certificates is 8% per annum and rate of interest on national saving bond is 10% per annum. How much money should she invest to earn maximum yearly income? Find also the maximum yearly income. 10