BACHELOR IN COMPUTER APPLICATIONS

07039

Term-End Examination

December, 2012

BCS-012 : BASIC MATHEMATICS

Time : 3 hours *Maximum Marks : 100*

*Note : Question no. 1 is **compulsory**. Attempt **any three** questions from the rest.*

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1. (a) Evaluate : $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$ 5

(b) For all $n \geq 1$, prove that : 5

$$1^2+2^2+3^2+\dots+n^2=\frac{n(n+1)(2n+1)}{6}$$

(c) If the points $(2, -3)$, $(\lambda, -1)$ and $(0, 4)$ are collinear, find the value of λ. 5

(d) The sum of n terms of two different arithmetic progressions are in the ratio $(3n+8) : (7n+15)$. Find the ratio of their 12^{th} term. 5

(e) Find $\frac{dy}{dx}$ if $y = \log\left[\frac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}}\right]$ 5

(f) Evaluate : $\int \frac{dx}{x^2 - 6x + 13}$ 5

(g) Find the unit vector in the direction of the sum of the vectors $\vec{a} = 2i + 2j - 5k$ and $\vec{b} = 2i + j + 3k \cdot$ 5

(h) Find the angle between the vectors with direction ratios proportional to (4, -3, 5) and (3, 4, 5). 5

2. (a) Solve the following system of linear equations using Cramer's rule. $x + 2y - z = -1$, $3x + 8y + 2z = 28$, $4x + 9y + z = 14$. 5

(b) Construct a (2×3) matrix whose elements a_{ij} is given by $a_{ij} = \frac{(i+j)^2}{2}$. 5

(c) Find the inverse of $A = \begin{bmatrix} 1 & 2 & 5 \\ 2 & 3 & 1 \\ -1 & 1 & 1 \end{bmatrix}$ and verify that $A^{-1}A = I$. 10

3. (a) Find the sum to n terms of the series 5

$$1 + \frac{4}{5} + \frac{4}{5^2} + \frac{4}{5^3} + \dots\dots\dots$$

(b) If 1, ω, ω^2 are three cube roots of unity. Show that : 5

$$(2-\omega)(2-\omega^2)(2-\omega^{10})(2-\omega^{11}) = 49$$

(c) If α and β are the roots of the equation $ax^2 + bx + c = 0$, $a \neq 0$ find the value of $\alpha^6 + \beta^6$. 5

(d) Solve the inequality $-3 < 4 - 7x < 18$ and graph the solution set. 5

4. (a) Evaluate : $\lim\limits_{x \to 0} \dfrac{\sqrt{1+x} - 1}{x}$ 5

(b) A rock is thrown into a lake producing a circular ripple. The radius of the ripple is increasing at the rate of 3 m/s. How fast is the area inside the ripple increasing when the radius is 10 m. 5

(c) Evaluate : $\displaystyle\int \frac{dx}{1 + \cos^2 x}$ 5

(d) Find the area enclosed by the circle $x^2 + y^2 = a^2$. 5

5. (a) If $\vec{a} = 5i - j - 3k$ and $\vec{b} = i + 3j - 5k$. **5**

Show that the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are perpendicular.

(b) Find the angle between the vectors $5i + 3j + 4k$ and $6i - 8j - k$. **5**

(c) Solve the following LPP graphically : **10**

Maximize : $z = 5x + 3y$

Subject to : $3x + 5y \leq 15$

$5x + 2y \leq 10$

$x, y \geqslant 0$
