No. of Printed Pages : 6 **BCS-012**

BACHELOR OF COMPUTER APPLICATIONS (BCA) (REVISED)

Term-End Examination

December, 2022

BCS-012 : BASIC MATHEMATICS

Time : 3 Hours *Maximum Marks : 100*

Note : *Question number **1** is compulsory. Attempt any **three** questions from the remaining questions.*

---

1. (a) If $A = \begin{bmatrix} 3 & 4 & -5 \\ 1 & 1 & 0 \\ 1 & 1 & 5 \end{bmatrix}$, show that A is row equivalent to I_3. 5

(b) Find the sum of an infinite G. P., whose first term is 28 and fourth term is $\frac{4}{49}$. 5

(c) Solve the inequality $\frac{5}{|x-3|} < 7$. 5

(d) Evaluate $\int \frac{x^2}{(x+2)^3} dx$. 5

(e) For any vectors $\vec{a}$ and $\vec{b}$, show that $\left|\vec{a}+\vec{b}\right| \le |\vec{a}| + |\vec{b}|$. 5

(f) Find the area bounded by the curves $y = x^2$ and $y^2 = x$. Also draw graph for the same. 5

(g) If z is a complex number such that $|z - 2i| = |z + 2i|$, show that Im $(z) = 0$. 5

(h) Find the quadratic equation whose roots are $(2 - \sqrt{3})$ and $(2 + \sqrt{3})$. 5

2. (a) Show that : 5

$$\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} = (y - x)(z - x)(z - y)$$

(b) Find $(\sqrt{3} + i)^3$ by using De Moivre's theorem. 5

(c) If $y = ax + \frac{b}{x}$, show that : 5

$$x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} - y = 0$$

(d) Find the points of discontinuity of the following function : 5

$$f(x) = \begin{cases} x^2, & \text{if } x > 0 \\ x + 3, & \text{if } x \leq 0 \end{cases}$$

3. (a) Solve the following system of linear equations using Cramer's rule : 5

$$x + y = 0$$

$$y + z = 1$$

$$z + x = 3$$

(b) If the first term of an A. P. is 22, the common difference is – 4, and the sum of n terms is 64, then find n. 5

(c) Find the length of the curve $y = 3 + \frac{x}{2}$ from (0, 3) to (2, 4). 5

(d) If $\vec{a}, \vec{b}, \vec{c}$ are coplanar vectors, then prove that $\vec{a} + \vec{b}, \vec{b} + \vec{c}$ and $\vec{c} + \vec{a}$ are also coplanar vectors. 5

4. (a) A child is holding string a flying kite, which is at the height of 50 m, from the ground. The wind carries away the kite horizontally, from the child, at the rate of 6.5 m/s. Determine the rate at which the kite string must be let out when the string is 130 m. 5

(b) Using determinants, find the area of triangle whose vertices are (1, 2), (–2, 3) and (–3, –4). 5

(c) Using the principle of mathematical induction, prove that :

$$\frac{1}{(1)(2)} + \frac{1}{(2)(3)} + ... + \frac{1}{n(n+1)} = \frac{n}{n+1}$$

for every natural number *n*. 5

(d) Reduce the matrix $A = \begin{bmatrix} 5 & 3 & 8 \\ 0 & 1 & 1 \\ 1 & -1 & 0 \end{bmatrix}$ to normal form and hence find its rank. 5

5. (a) Find the vector and Cartesian equations of the line passing through the points (–2, 0, 3) and (3, 5, –2). 5

(b) If $y = \ln\left[e^x \left(\frac{x-2}{x+2}\right)^{3/4}\right]$, find $\frac{dy}{dx}$. 5

(c) A person wishes to invest at most ` 12,000 in ‘ option A’ and ‘option B’. He must invest at least ` 2,000 in ‘option A’ and at least ` 14,000 in ‘option B’. If ‘option A’ gives return of 8% and ‘option B’ gives return of 10%, determine how much investment should be done in respective options to maximize the returns. 10