

BACHELOR OF COMPUTER APPLICATIONS
(BCA) (Revised)

Term-End Examination, 2019

BCS-012 : BASIC MATHEMATICS

Time : 3 Hours]

[Maximum Marks : 100

Note : Question no.1 is compulsory. Attempt any three questions from remaining four questions.

1. (a) Show that :
$$\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix} = \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} \quad [5]$$

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

(c) Use mathematical induction to show that $1+3+5+\dots+(2n-1) = n^2 \forall n \in \mathbb{N}$ [5]

(d) If α, β are roots of $x^2 - 3ax + a^2 = 0$, find a if

$$\alpha^2 + \beta^2 = \frac{1}{7}. \quad [5]$$



(e) If $1, w, w^2$ are cube roots of unity, find the value of: $(2+w)(2+w^2)(2+w^{22})(2+w^{26})$ [5]

(f) If 9th term of an A.P. is 25 and 17th term of the A.P. is 41, find its 20th term. [5]

(g) If $y = 3xe^{-x}$, find $\frac{d^2y}{dx^2}$ [5]

(h) Evaluate $\int x\sqrt{2x+3} dx$. [5]

2. (a) If $A = \begin{bmatrix} 0 & 3 & -1 \\ 2 & 1 & 3 \\ -1 & 0 & 0 \end{bmatrix}$, show that $A(\text{adj}A) = |A|I_3$. [5]

(b) If $A = \begin{pmatrix} 3 & -1 & 0 \\ 2 & 1 & 1 \\ 1 & 1 & 0 \end{pmatrix}$, show that A is equivalent to I_3 . [5]

(c) If $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$, show that $A^2 - 4A + I = O$, where I and O are identity and null matrix respectively of order 2. Also, find A^5 . [5]

- (d) Use principle of mathematical induction to show that $2^{3n}-1$ is divisible by 7. [5]

- 3 (a) Find all solutions of : $z^2 = \bar{z}$ [5]
(\bar{z} is conjugate of z)

- (b) Solve the equation : [5]

$x^3 - 13x^2 + 15x + 189 = 0$ if one root of the equation exceeds other by 2.

- (c) Solve the inequality : $\left| \frac{2x-3}{4} \right| \leq \frac{2}{3}$ [5]

- (d) If $y = \ln \left[e^x \left(\frac{x-1}{x+1} \right)^{3/2} \right]$, find $\frac{dy}{dx}$. [5]

- 4 (a) If $a > 0$, find local maximum and local minimum values of $f(x) = x^3 - 2ax^2 + a^2x$. [5]

- (b) Evaluate $\int \frac{dx}{3+e^x}$. [5]

- (c) Evaluate $\int_{-1}^2 \frac{x}{(x^2+1)^2} dx$ [5]

- (d) Find the area bounded by the x -axis, $y = 3 + 4x$ and the ordinates $x = 1$ and $x = 2$, by using integration. [5]

5. (a) If the mid-points of the consecutive sides of a quadrilateral are joined, then show that the quadrilateral formed is a parallelogram. [5]

- (b) If $\vec{a} = \hat{i} + 2\hat{j} - \hat{k}$, $\vec{b} = \hat{j} + \hat{k}$, $\vec{c} = 3\hat{i} - \hat{j} + \hat{k}$, find $(\vec{a} \times \vec{b}) \times \vec{c}$. [5]

- (c) Find equation of line passing through $(-1, -2, 3)$ and perpendicular to the lines :

$$\frac{x}{1} = \frac{y}{3} = \frac{z}{2} \text{ and } \frac{x+2}{-3} = \frac{y-1}{5} = \frac{z+1}{2} \quad [5]$$

- (d) Maximize : [5]

$$Z = 2x + 3y$$

Subject to :

$$x + y \geq 1$$

$$2x + y \leq 4$$

$$x + 2y \leq 4,$$

$$x \geq 0, y \geq 0$$

----- x -----