BCA-I/BCA-GE-01/19

BCA 1st Semester (Honours) Examination, 2019-20 (CBCS)

BACHELOR OF COMPUTER APPLICATION

Course ID : 13514 **Course Code : BCA-GE-01**

Course Title : Mathematics-I

Time: 3 Hours **Full Marks: 80**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group-A

1. Answer *all* the questions: 1×10=10

(i) If A be an orthogonal matrix, then A^{-1} will be

(a) A (b) A^2

(c) A^T (d) A^3

(e) None of these

(ii) The conic $^8/_r = 4 - 5\cos\theta$ represents

(a) a parabola (b) an ellipse

(c) a hyperbola (d) a circle

(e) None of these

(iii) If $x = \cos\theta + i\sin\theta$, then $x^n - {}^1/_{x^n}$ is equals to

(a) $2i\sin n\theta$ (b) $2i\cos n\theta$

(c) $2\sin n\theta$ (d) $2\cos\theta$

(e) None of these

(iv) If $A = \begin{pmatrix} 0 & 0 \\ 1 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ then

(a) $AB = 0$ (b) $BA = 0$

(c) $AB = BA = 0$ (d) $AB \neq BA$

(e) None of these

(v) If $f(x) = x^3 - 3x^2 + 4x - 3$ then $f(\sqrt{2})$ is

(a) $6\sqrt{2}$ (b) $6\sqrt{2} - 9$

(c) 9 (d) $6\sqrt{2} + 9$

(e) None of the above

(vi) If $\vec{a} = 2\vec{\imath} - \vec{\jmath}$ and $\vec{b} = 3\vec{\imath} - 2\vec{\jmath} + 4\vec{k}$ then value of $\vec{a} \times \vec{b}$ is

(a) $4\vec{\imath} - 8\vec{\jmath} - \vec{k}$ (b) $-4\vec{\imath} - 8\vec{\jmath} + \vec{k}$

(c) $4\vec{\imath} - 8\vec{\jmath} + \vec{k}$ (d) $-4\vec{\imath} - 8\vec{\jmath} - \vec{k}$

(e) None of these

(vii) The modulus of the complex numbers $\sqrt{12} + 6\left(\frac{1-i}{1+i}\right)$ is

(a) 4 (b) $4\sqrt{3}$

(c) $6\sqrt{3}$ (d) $\sqrt{3}$

(e) None of these

(viii) If $A \subseteq B$ and $B \subseteq A$ then

(a) $A = \phi$ (b) $A = B$

(c) $B \neq \phi$ (d) $A \cap B = \phi$

(e) None of these

(ix) If α, β, γ are the roots of the equation $x^2 - px + q = 0$ then $\sum {}^1/_\alpha =$

(a) ${}^p/_q$ (b) ${}^q/_p$

(c) p (d) q

(e) None of these

(x) The centre of the circle $2x^2 + 2y^2 + {}^5/_2\, x - {}^7/_2\, y + 3 = 0$ is

(a) $\left({}^5/_2, -{}^7/_2\right)$ (b) $\left(-{}^5/_4, {}^7/_4\right)$

(c) $\left(-{}^5/_2, {}^7/_2\right)$ (d) $\left({}^5/_4, -{}^7/_4\right)$

(e) None of these

Group-B

2. Answer *any ten* questions: 2×10=20

(a) If $x = \{0, 1\}$ and $y = \{1, 2\}$ find $x \times y$.

(b) If $A = \{x : -10 \leq x \leq 10\}$ and $B = \{y : 0 \leq y \leq 20\}$ find $A \cup B$ and $A - B$.

(c) What is mapping?

(d) Find the value of $\sqrt{-3 + \sqrt{-3 + \sqrt{-3 + \cdots}}}$

(e) Find the Polynomial $3x^3 - 4x^2 + 5x + 6$ as a polynomial of $(x + 1)$.

(f) Find the value of i^i.

(g) Form the equation whose roots are 8 and 9.

(h) If $A = \begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}$ then evaluate $A^2 - 5A$.

(i) Find the nature of the conic $3x^2 + 2xy + 3y^2 - 16x + 20 = 0$

(j) State the Descarte's rule of signs.

(k) Find $\left(\vec{\imath} + 2\vec{\jmath} + 3\vec{k}\right) \times \left(2\vec{\imath} + \vec{\jmath} - \vec{k}\right)$

(l) If $\left|\vec{A} + \vec{B}\right| = 60, \left|\vec{A} - \vec{B}\right| = 40$ and $\left|\vec{B}\right| = 46$ then find the value of $|\vec{A}|$.

(m) Find the value of determinant $\begin{vmatrix} 265 & 240 & 219 \\ 240 & 225 & 198 \\ 219 & 198 & 181 \end{vmatrix}$.

(n) If $x + {}^{1}/_{x} = 2\cos {}^{\pi}/_{7}$ then find the value of $x^7 + {}^{1}/_{x^7}$.

(o) Find the set of vectors (1, 2, 3), (2, –1, 4) and (–1, 8, 1).

Group-C

3. Answer *any four* questions: 5×4=20

(a) Show that the function $f : R \to R$ defined by $f(x) = x^3 + x$ is bijective, where R is the set of real numbers.

(b) Prove that $\begin{vmatrix} -2a & a+b & a+c \\ b+a & -2b & b+c \\ c+a & c+b & -2c \end{vmatrix} = 4(a+b)(b+c)(c+a)$

(c) Solve by Cramer's rule: $x + 2y + 3z = 6, 2x + 4y + z = 7, 3x + 2y + 9z = 14$.

(d) If $A = \begin{pmatrix} 1 & -1 & 1 \\ 2 & -1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$ then find A^2 and show that $A^2 = A^{-1}$.

(e) Solve by matrix method, the equations $x + y + z = 8, x - y + 2z = 6, 3x + 5y - 7 = 14$.

(f) Show that the mapping $f : Q \to Q$ defined by $f(x) = 3x + 2$ is one-one onto, where Q is the set of rational numbers. Also find a formula for f^{-1}.

Group-D

4. Answer *any three* questions: 10×3=30

(a) (i) Define Ring. Explain the property of ring.

(ii) Prove that A field is an integral domain.

(b) (i) If α, β, γ be the roots of the equation $x^3 - px^2 + qx - r = 0$, then form the equation whose roots are $\beta\gamma + {}^{1}/_{\alpha}, \gamma\alpha + {}^{1}/_{\beta}, \alpha\beta + {}^{1}/_{\gamma}$.

(ii) Solve $x^3 - 18x - 35 = 0$ by Cardan's method.

(c) Show that a triangle the perpendiculars drawn from the vertices to the opposite sides are concurrent.

(d) Find the general equation of a parabola.

(e) Find the equations of the tangents to the conic $x^2 + 4xy + 3y^2 - 5x - 6y + 3 = 0$ which are parallel to the straight line $x + 4y = 0$.

(f) Find the nature of the conic ${}^{l}/_{r} = 1 + e\cos\theta$.

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