No. of Printed Pages : 4 **13994** **BCS-012**

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.

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1. (a) Show that : $\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix} = \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$ [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 $1+3+5+\dots\dots\dots+(2n-1) = n^2 \ \forall \ n \in N$ [5]

   (d) If α, β are roots of $x^2 - 3ax + a^2 = 0$, find a if $\alpha^2 + \beta^2 = \frac{1}{7}$. [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(adjA)= $|A|I_3$. [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 : $\left|\frac{2x-3}{4}\right| \le \frac{2}{3}$ [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 $\vec{a}=\hat{i}+2\hat{j}-\hat{k}, \vec{b}=\hat{j}+\hat{k}, \vec{c}=3\hat{i}-\hat{j}+k$, 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 :

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

(d) Maximize : [5]

$Z=2x+3y$

Subject to :

$x+y\geq 1$

$2x+y\leq 4$

$x+2\ y\leq 4,$

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

----- x -----