00002

No. of Printed Pages : 4

**BCS-012**

# BACHELOR OF COMPUTER APPLICATION

## (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 the remaining questions.



1. Attempt all parts :

(a) Show that : [5]

$$\begin{vmatrix} 1 & ab & (a+b)c \\ 1 & ca & (c+a)b \\ 1 & bc & (b+c)a \end{vmatrix} = 0$$

(b) If $A = \begin{pmatrix} 2 & -1 \\ 0 & 3 \end{pmatrix}$ and $I_2 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, find $A^2 - 5A + 6I_2$. [5]

(c) Show that 8 divides $3^{2n} - 1 \; \forall n \in \mathbb{N}$. [5]

(d) If a, b, c are pth, qth and rth term of an A.P. respectively, show that : [5]

(q - r) a + (r - p) b + (p-q)c = 0

(e) If 1, w, $w^2$ are cube roots of unity, find : [5]

$(1 + w + 3w^2)^6 + (1 + 2w + 2w^2)^6$

(f) If $\alpha$, $\beta$ are roots of $x^2 - 4ax + 4a^2 - 9 = 0$ and $\alpha^2 + \beta^2 = 26$, find a. [5]

(g) If $y = ln\left(x + \sqrt{x^2 + 1}\right)$, find $\frac{dy}{dx}$. [5]

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

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

(b) If $A = \begin{pmatrix} 1 & -1 & 2 \\ 0 & 4 & 7 \\ 3 & 2 & 1 \end{pmatrix}$, show that A is row equivalent to $I_3$. [5]

(c) If $A = \begin{pmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{pmatrix}$ and

$B = \begin{pmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{pmatrix}$, show that $AB = 6I_3$. Use it to solve the system of linear equations : [10]

$x - y = 1$

$2x + 3y + 4z = 7$

$y + 2z = 1$



3. (a) Find the sum of all the integers between 100 and 700 which are divisible by 8. [5]

(b) Use DeMoivre's theorem to obtain $(1 + i)^8$ [5]

(c) Solve $x^3 - 9x^2 + 23x - 15 = 0$, two of the roots are in the ratio 3 : 5. [5]

(d) Solve $\frac{3x-1}{x+2} < 3$, $x \in \mathbb{R}$ [5]

4. (a) Determine the interval in $f(x) = e^{1/x}$, $x \neq 0$, is decreasing. [5]

(b) Evaluate $\int \frac{e^{2x}}{e^{x}+1} dx$ [5]

(c) Find the area bounded by $y = \sqrt{x}$ and $y = x$. [5]

(d) Using integration find the length of y = 3 + x from (1, 4) to (3, 6). [5]

5. (a) Show that : [5]

$$[\vec{a}+\vec{b} \quad \vec{b}+\vec{c} \quad \vec{c}+\vec{a}] = 2[\vec{a}\,\vec{b} \quad \vec{c}]$$

(b) Find shortest distance between

$\vec{r} = \hat{i} - \hat{j} + t(2\hat{i} + \hat{k})$ and

$\vec{r} = 2\hat{i} - \hat{j} + s(\hat{i} + \hat{j} - \hat{k})$ [5]

(c) Right moves dance academy wishes to run two dance courses - Hip-hop and Contemporary. Fee for Hip-hop is Rs. 300 per hour and for contemporary it is Rs. 250 per hour. The academy can accommodate at most 15 in hip-hop and at most 20 in contemporary. If the total number of students cannot exceed 30, find the maximum revenue academy can get per hour. [10]

----- x -----