BCS-012

BACHELOR OF COMPUTER APPLICATIONS (BCA) (Revised)

Term-End Examination

00603   **December, 2018**

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. Attempt all parts :

   (a) Show that

$$\begin{vmatrix} b-c & c-a & a-b \\ c-a & a-b & b-c \\ a-b & b-c & c-a \end{vmatrix} = 0.$$

   5

   (b) If $A = \begin{pmatrix} 1 & -2 \\ 2 & 1 \end{pmatrix}$, and $I_2 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$,

   find $(A - I_2)^2$.   5

   (c) Show that 7 divides $2^{3n} - 1 \ \forall \ n \in \mathbf{N}$.   5

(d) If 7 times the 7th term of an A.P. is equal to 11 times the 11th term of the A.P., find its 18th term. 5

(e) If 1, ω, ω^2 are the cube roots of unity, find
$$(2 + \omega + \omega^2)^6 + (3 + \omega + \omega^2)^6.$$ 5

(f) If α, β are roots of $x^2 - 2kx + k^2 - 1 = 0$, and $\alpha^2 + \beta^2 = 10$, find k. 5

(g) If $y = (x + \sqrt{x^2 + 1})^3$, find $\dfrac{dy}{dx}$. 5

(h) Evaluate : 5

$$\int x \sqrt{3 - 2x} \, dx$$

2. (a) If $A = \begin{bmatrix} -1 & 2 & 3 \\ 4 & 5 & 7 \\ 5 & 3 & 4 \end{bmatrix}$, show that

A(adj A) = 0. 5

(b) If $A = \begin{pmatrix} 1 & 1 & 3 \\ 0 & 5 & 2 \\ 2 & -1 & 7 \end{pmatrix}$, show that A is row

equivalent to I_3. 5

(c) Solve the following system of linear equations by using matrix inverse :

$$3x + 4y + 7z = -2$$
$$2x - y + 3z = 6$$
$$2x + 2y - 3z = 0$$

and hence, obtain the value of $3x - 2y + z$. *10*

3. (a) Find the sum of first all integers between 100 and 1000 which are divisible by 7. *5*

(b) Use De Moivre's theorem to find $(i + \sqrt{3})^3$. *5*

(c) Solve : *5*

$$32x^3 - 48x^2 + 22x - 3 = 0,$$

given the roots are in A.P.

(d) Solve : *5*

$$\frac{2x - 5}{x + 2} < 5, \; x \in \mathbf{R}$$

4. (a) Find the points of local maxima and local minima of

$$f(x) = x^3 - 6x^2 + 9x + 100.$$ *5*

(b) Evaluate : *5*

$$\int \frac{dx}{e^x + 1}$$

(c) Find the area lying between two curves

$$y = 3 + 2x , \ y = 3 - x, \ 0 \le x \le 3,$$

using integration.   *5*

(d) Find length of $y = 3 - 2x$ from

$(0, 3)$ to $(2, -1)$, using integration.   *5*

5. (a) If $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, show that

$$\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a}.$$ *5*

(b) Check if the lines

$$\frac{x-1}{4} = \frac{y-3}{4} = \frac{z+2}{-5} \ \text{and}$$

$$\frac{x-8}{7} = \frac{y-4}{1} = \frac{z-5}{3}$$

intersect or not.   *5*

(c) Perky Owl takes up designing and photography jobs. Designing job fetches the company ₹ 2000/hr and photography fetches them ₹ 1500/hr. The company can devote at most 20 hours per day to designing and at most 15 hours to photography. If total hours available for a day is at most 30, find the maximum revenue Perky Owl can get per day.   *10*