BCS-012

BACHELOR OF COMPUTER APPLICATIONS (BCA) (Revised)

Term-End Examination

08313   June, 2015

BCS-012 : BASIC MATHEMATICS

Time : 3 hours   *Maximum Marks : 100*

Note : *Question number 1 is **compulsory**. Attempt any **three** questions from the rest.*

1. (a)   Show that

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc + bc + ca + ab. \qquad 5$$

   (b)   If $A = \begin{pmatrix} \dfrac{1}{2} & -\dfrac{\sqrt{3}}{2} \\ \dfrac{\sqrt{3}}{2} & \dfrac{1}{2} \end{pmatrix}$, find A^3.   5

   (c)   Use the principle of mathematical induction to show that

$$2 + 2^2 + ... + 2^n = 2^{n+1} - 2. \ \forall \ n \in N \qquad 5$$

(d)   Find the 18th term of a G.P. whose 5th term is 1 and common ratio is 2/3. 5

(e)   If $(a - ib) (x + iy) = (a^2 + b^2) i$ and $a + ib \neq 0$, find x and y. 5

(f)   Find two numbers whose sum is 54 and product is 629. 5

(g)   If $y = ae^{mx} + be^{-mx}$, show that $\dfrac{d^2y}{dx^2} = m^2y$. 5

(h)   Find the equation of the straight line through
$(-2, 0, 3)$ and $(3, 5, -2)$. 5

2. (a)   If $A = \begin{bmatrix} 5 & 3 & 0 \\ 3 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, find A^{-1}. 5

(b)   Solve the system of equations $x + y + z = 5$, $y + z = 2$, $x + z = 3$ by using Cramer's rule. 5

(c)   Find the area of $\triangle$ ABC whose vertices are A (1, 3), B (2, 2) and C (0, 1). 5

(d)   Reduce $A = \begin{bmatrix} 5 & 3 & 8 \\ 0 & 1 & 1 \\ 1 & -1 & 0 \end{bmatrix}$ to normal
form by elementary operations. 5

3. (a) Find the sum to n terms of the series
$0\cdot7 + 0\cdot77 + 0\cdot777 + ...$ 5

(b) Find three terms in G.P. such that their sum is 31 and the sum of their squares is 651. 5

(c) If α and β are roots of $x^2 - 4x + 2 = 0$, find the equation whose roots are $\alpha^2 + 1$ and $\beta^2 + 1$. 5

(d) Solve the inequality
$x^2 - 4x - 21 \le 0.$ 5

4. (a) Find the value of constant k so that

$$f(x) = \begin{cases} \dfrac{x^2 - 25}{x - 5} & \text{if } x \ne 5 \\ k & \text{if } x = 5 \end{cases}$$ 5

is continuous at x = 5.

(b) If $y = \dfrac{1 - e^x}{e^{2x}}$, find $\dfrac{dy}{dx}$. 5

(c) If a mothball evaporates at a rate proportional to its surface area $4\pi r^2$, show that its radius decreases at a constant rate. 5

(d) Evaluate :

$$\int_0^2 \frac{x^2}{(x + 2)^3} \, dx$$ 5

5. (a) Show that the three points with position vectors $-2\vec{a} + 3\vec{b} + 5\vec{c}$, $\vec{a} + 2\vec{b} + 3\vec{c}$, $7\vec{a} - \vec{c}$ are collinear. *5*

(b) Find the direction cosines of the line passing through $(1, 2, 3)$ and $(-1, 1, 0)$. *5*

(c) Two electricians, A and B, charge ₹ 400 and ₹ 500 per day respectively. A can service 6 ACs and 4 coolers per day while B can service 10 ACs and 4 coolers per day. For how many days must each be employed so as to service at least 60 ACs and at least 32 coolers at minimum labour cost ? Also calculate the least cost. *10*