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BCS-012

BACHELOR OF COMPUTER APPLICATIONS
(Revised)

07824

Term-End Examination

December, 2014

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

$$\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix} = xyz\,(x-y)\,(y-z)\,(z-x) \qquad 5$$

(b) Let $A = \begin{bmatrix} 2 & 3 \\ 0 & 1 \end{bmatrix}$ and $f(x) = x^2 - 3x + 2$. Show that $f(A) = O_{2\times 2}$. Use this result to find A^4. 5

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

$$\sum_{i=0}^{n-1} 2^i = 2^n - 1, \ \forall\, n \in \mathbf{N}. \qquad 5$$

(d) If the sum of p terms of an A.P. is $4p^2 + 3p$, find its n^{th} term. 5

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

(f) Evaluate : 5

$$\int \frac{e^x}{(e^x+1)^3}\,dx$$

(g) Find the area bounded by the curve $y = \sin x$ and the lines $x = \frac{\pi}{4}$, $x = \frac{\pi}{2}$ and the x-axis. 5

(h) Find $|\vec{a} \times \vec{b}|$ if $|\vec{a}| = 10$, $|\vec{b}| = 2$ and $\vec{a} \cdot \vec{b} = 10\sqrt{2}$. 5

2. (a) Solve the following system of equations by using Cramer's rule : 5

$$x + y = 0, \quad y + z = 1, \quad z + x = 3$$

(b) If $A = \begin{bmatrix} 3 & 2 & 0 \\ 4 & 3 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, find A^{-1}. 5

(c) Show that the points (2, 5), (4, 3) and (5, 2) are collinear. 5

(d) Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 2 & 5 & 8 \end{bmatrix}$. 5

3. (a) If 7 times the 7^{th} term of an A.P. is equal to 11 times the 11^{th} term of the A.P., find its 18^{th} term. *5*

(b) Find the sum to n terms of the series :

$9 + 99 + 999 + 9999 + ...$ *5*

(c) If $x + iy = \sqrt{\frac{a + ib}{c + id}}$, then show that $x^2 + y^2 = \sqrt{\frac{a^2 + b^2}{c^2 + d^2}}$. *5*

(d) If α and β are roots of $2x^2 - 3x + 5 = 0$, find the equation whose roots are $\alpha + (1/\beta)$ and $\beta + (1/\alpha)$. *5*

4. (a) Evaluate : *5*

$$\lim_{x \to 5} \frac{\sqrt{x-1} - 2}{x - 5}$$

(b) Find the local extrema of

$$f(x) = \frac{3}{4} x^4 - 8x^3 + \frac{45}{2} x^2 + 105$$ *5*

(c) Evaluate : *5*

$$\int \frac{x^2 + 1}{x(x^2 - 1)} dx$$

(d) Find the length of the curve $y = \frac{2}{3}x^{3/2}$ from (0, 0) to (4, 16/3). 5

5. (a) Find the area of Δ ABC with vertices A(1, 3, 2), B(2, – 1, 1) and C(– 1, 2, 3). 5

(b) Find the angle between the lines

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

(c) A tailor needs at least 40 large buttons and 60 small buttons. In the market two kinds of boxes are available. Box A contains 6 large and 2 small buttons and costs ₹ 3, box B contains 2 large and 4 small buttons and costs ₹ 2. Find out how many boxes of each type should be purchased to minimize the expenditure. 10