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BCS-012

07489

BACHELOR OF COMPUTER APPLICATIONS (Revised)

Term-End Examination

June, 2014

BCS-012 : BASIC MATHEMATICS

Time : 3 hours *Maximum Marks : 100*

Note : *Question No.* ***1*** *is* ***compulsory.*** *Attempt* ***any three*** *questions from the remaining four questions.*

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1. (a) Show that the points (a, b + c), (b, c + a) and (c, a + b) are collinear. 5

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

(c) Use the principle of mathematical induction to show that : 5

$$1^2 + 2^2 + \ldots\ldots + n^2 = \frac{1}{6} n (n+1) (2n+1)$$

$\forall n \in \mathbf{N}$.

(d) Find the smallest positive integer n for which 5

$$\left(\frac{1+i}{1-i}\right)^n = 1.$$

(e) A positive number exceeds its square root by 30. Find the number. 5

(f) If $y = \frac{\ln x}{x^2}$, find $\frac{dy}{dx}$. **5**

(g) Show that for any vector $\vec{a}$, **5**

$$\hat{i} \times (\vec{a} \times \hat{i}) + \hat{j} \times (\vec{a} \times \hat{j}) + \hat{k} \times (\vec{a} \times \hat{k}) = 2\vec{a}$$

(h) Find an equation of the line through (1, 0, − 4) and parallel to the line **5**

$$\frac{x+1}{3} = \frac{y+2}{4} = \frac{z-2}{2}.$$

2. (a) Find inverse of the matrix **5**

$$A = \begin{bmatrix} 1 & 2 & 5 \\ 2 & 3 & 1 \\ -1 & 1 & 1 \end{bmatrix}.$$

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

(c) Solve the system of linear equations **10**

$2x - y + z = 5$

$3x + 2y - z = 7$

$4x + 5y - 5z = 9$

by matrix method.

3. (a) Use DeMoivre's theorem to put $\left(\sqrt{3}+i\right)^3$ in the form $a+bi$. 5

(b) Find the sum to n terms of the series $0.7+0.77+0.777+\dots\dots\dots+$ upto n terms. 5

(c) If one root of the quadratic equation $ax^2+bx+c=0$ is square of the other root, show that $b^3+a^2c+ac^2=3abc$. 5

(d) The cost of manufacturing x mobile sets by Josh Mobiles is given by $C=3000+200x$ and the revenue from selling x mobiles is given by $300x$. How many mobiles must be produced to get a profit of ₹7,03,000 or more. 5

4. (a) If $y=ae^{mx}+be^{-mx}$ and $\frac{d^2y}{dx^2}=ky$, find the value of k in terms of m. 5

(b) A man 180 cm tall walks at a rate of 2 m/s away from a source of light that is 9 m above the ground. How fast is the length of his shadow increasing when he is 3 m away from the base of light ? 5

(c) Evaluate the integral $\int \frac{x}{(x+1)(2x-1)}dx$. 5

(d) Find length of the curve $y=2x^{3/2}$ from (1, 2) to (4, 16). 5

5. (a) For any two vectors $\vec{a}$ and $\vec{b}$, prove that 5

$|\vec{a} + \vec{b}| \leq |\vec{a}| + |\vec{b}|$.

(b) Find the shortest distance between $\vec{r_1}$ and $\vec{r_2}$ given below : 5

$$\vec{r_1} = (1+\lambda)\hat{i} + (2-\lambda)\hat{j} + (1+\lambda)\hat{k}$$

$$\vec{r_2} = 2(1+\mu)\hat{i} + (1-\mu)\hat{j} + (-1+2\mu)\hat{k}.$$

(c) A tailor needs at least 40 large buttons and 60 small buttons. In the market, buttons are available in boxes and cards. A box contains 6 large and 2 small buttons and a card contains 2 large and 4 small buttons. If the cost of a box is ₹ 3 and that of card is ₹ 2, find how many boxes and cards should he buy so as to minimize the expenditure ? 10