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BCS–012

BACHELOR IN COMPUTER APPLICATIONS

Term-End Examination 06260

December, 2011

BCS–012 : BASIC MATHEMATICS

Time : 3 hours *Maximum Marks : 100*

Note : Question no. 1 is compulsory. Attempt any three from four.

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1. (a) Show that 5

$$\Delta = \begin{vmatrix} -a^2 & ab & ac \\ ba & -b^2 & bc \\ ca & cb & -c^2 \end{vmatrix} = 4a^2b^2c^2$$

(b) Construct a 2×2 Matrix $A = [aij]_{2 \times 2}$ where each element is given by $aij = \frac{1}{2}(i-j)^2$ 5

(c) Use the principle of Mathematical Induction to prove that $\rightarrow$ 5

$$1^3 + 2^3 + 3^3 + ------ + n^3 = \frac{1}{4} n^2 \ (n+1)^2$$

(d) Find the Sum to n terms of the series **5**

$5+55+555+\text{------}+n$ Terms

(e) Find the points of local maxima and local minima. If any of the function **5**

$f(x)=x^3-6x^2+9x+1$

(f) Evaluate Integral $\int \frac{x}{(x-1)(x+5)(2x-1)}.dx$ **5**

(g) Find the value of λ for which the vectors **5**

$\vec{a}=\hat{i}-4\hat{j}+\hat{k}$

$\vec{b}=\lambda\hat{i}-2\hat{j}+\hat{k}$ and $\vec{c}=2\hat{i}+3\hat{j}+3\hat{k}$

are coplaner.

(h) Find the equation of line passing through the point $(-1, 3, -2)$ and perpendicular to the two lines. **5**

$$\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$$

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

2. (a) Solve following system of linear equations using Cramer's Rule **5**

$x+2y-z=-1$

$3x+8y+2z=28$

$4x+9y+z=14$

(b) If $A = \begin{bmatrix} 3 & 2 \\ 4 & 0 \end{bmatrix}$ $B = \begin{bmatrix} 4 & 5 \\ 2 & 5 \end{bmatrix}$ 5

Verify $(AB)^{-1} = B^{-1}A^{-1}$

(c) Reduce the Matrix 10

$$A = \begin{bmatrix} 1 & 0 & 2 & 1 \\ 2 & 1 & 3 & 2 \\ 1 & 3 & 1 & 3 \end{bmatrix} \text{ to Normal}$$

form and hence find its Rank.

3. (a) If Sum of three Numbers in G.P is 38 and their product is 1728. Find the Numbers. 5

(b) If 1, w, w^2 are Cube roots of unity then show that. 5

$$(1 - w + w^2)^5 + (1 + w - w^2)^5 = 32.$$

(c) If α, β are the roots of the equation $2x^2 - 3x + 1 = 0$, form an equation whose roots are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$. 5

(d) Solve the inequality, and graph the 5

$-2 < \frac{1}{5}(4-3x) \leq 8$ solution set.

4. (a) If $x = a\left(t - \frac{1}{t}\right)$ and $y = a\left(t + \frac{1}{t}\right)$. 5

Find $\frac{dy}{dx}$.

(b) Sand is being poured in to a cônical pile at constant rate 50 cm^3/ minute. Frictional forces in sand are such that the height of cone is always one half of the radius of its base. How fast is the height of the pile. Increasing when the sand is 5cm deep ? 5

(c) Evaluate $\int \frac{(a^x + b^x)^2}{a^x b^x} dx$ 5

(d) Find the area bounded by curves $y = x^2$ and $x = y^2$ 5

5. (a) Find a unit vector perpendicular to each of the vector $\left(\vec{a} + \vec{b}\right)$ and $\left(\vec{a} - \vec{b}\right)$ where $\vec{a} = \hat{i} + 2\hat{j} - 4\hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + 2\hat{k}$ 5

(b) Find 'k' so that the lines are at Right Angle 5

$$\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2} \text{ and,}$$

$$\frac{x-1}{3k} = \frac{y-5}{1} = \frac{z-6}{-5}$$

(c) Best Gift packs company manufactures two types of gift packs type A and type B. Type A requires 5 minutes each for cutting and 10 minutes for assembling. Type B require 8 minutes each for cutting and 8 minutes for assembling. There are at most 200 minutes available for cutting and at most 4 hours, available for assembling. The profit is ₹ 50 each for type A and ₹ 25 for type B. How many gift packs of each type should the company manufacture in order to maximise the profit. 10