MS – 395

II Semester B.C.A. Degree Examination, May 2011
(Y2K8 Scheme) (2008 – 09 and Onwards)
BCA - 203 : MATHEMATICS

Time : 3 Hours Max. Marks : 90

***Instruction** : Answer **all** Sections.*

SECTION – A

I. Answer **any ten** of the following. **(10×2=20)**

1) Define Scalar matrix with an example.

2) Evaluate $\begin{vmatrix} 1 & 6 & 7 \\ 2 & 3 & 0 \\ 0 & 1 & 4 \end{vmatrix}$

3) In a group $G = \{2, 4, 6, 8\} \otimes_{10}$. Find the identity.

4) Define a group.

5) Show that the vectors $\hat{i} - 2\hat{j} + 5\hat{k}$ and $-2\hat{i} + 4\hat{j} + 2\hat{k}$ are orthogonal.

6) Find the projection of $2\hat{i} + 3\hat{j} - 2\hat{k}$ on $\hat{i} + 2\hat{j} + 3k$

7) Find the n^{th} derivative of $\cos^3 x$.

8) Find the n^{th} derivative of $e^{2x} \sin 3x$.

9) Evaluate $\int \sqrt{1-4x}\, dx$.

10) Evaluate $\int_0^1 (x^2 - 1)^2 dx$

P.T.O.

11) Solve $(x^2+1)\frac{dy}{dx}=1$

12) Find the integrating factor of the equation $\frac{dy}{dx}+\frac{2}{x}y=x\log x$

13) If the direction ratio's of a line are (2, 3, – 6), find its direction cosines.

14) Show that the points (–1, 2, –3), (4, 5, 1), (9, 8, 5) are collinear.

15) Find the angle between the lines whose direction ratios are (1, 2, 3) and (3, –1, 2)

SECTION – B

II. Answer **any four** of the following. **(4×5=20)**

1) Solve using Cramer's rule

$3x - y + 2z = 13$

$2x + y - z = 3$

$x + 3y - 5z = -8$

2) Find the inverse of the matrix.

$$A=\begin{bmatrix}3 & -3 & 4\\ 2 & -3 & 4\\ 0 & -1 & 1\end{bmatrix}$$

3) Find the eigen values and the corresponding eigen vectors of $A=\begin{bmatrix}4 & 1\\ -1 & 2\end{bmatrix}$.

4) Find the n^{th} derivative of cos (ax + b).

5) Find $\frac{d^n}{dx^n}\left[\frac{x+1}{(x+2)(x-2)}\right]$.

6) If $y=e^{m\cos^{-1}x}$ prove that $(1-x^2)y_{n+2}-(2n+1)xy_{n+1}-(n^2+m^2)y_n=0$

SECTION – C

III. Answer **any four** of the following. **(4×5=20)**

7) Prove that G = {1, w, w^2} forms an abelian group under multiplication.

8) Prove that G = {1, 5, 7, 11} is a group under multiplication modulo 12.

9) Prove that H = {0, 2, 4} is a subgroup of a group G = {0, 1, 2, 3, 4, 5} under addition modulo 6.

10) Find the unit vector perpendicular to both vectors $3\hat{i}+\hat{j}-2\hat{k}$ and $2\hat{i}+3\hat{j}-\hat{k}$.

11) If the vectors $2\hat{i}-3\hat{j}+m\hat{k}$, $2\hat{i}+\hat{j}-\hat{k}$ and $6\hat{i}-\hat{j}+2\hat{k}$ are coplanar. Find m.

12) Prove that $\left[\vec{a}\times\vec{b},\ \vec{b}\times\vec{c},\ \vec{c}\times\vec{a}\right]=\left[\vec{a}\,\vec{b}\,\vec{c}\right]^2$.

SECTION – D

V. Answer **any four** of the following. **(4×5=20)**

13) Evaluate $\int\frac{x+2}{(x+3)(x+1)}dx$.

14) Evaluate $\int\frac{dx}{4+5\sin x}$

15) Evaluate $\int_0^{\frac{\pi}{2}}\frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}}dx$.

16) Solve $\left(e^y+1\right)\cos x\,dx+e^y\sin x\,dy=0$.

17) Solve $\frac{dy}{dx}=\frac{x+2y}{x-y}$

18) Solve $\frac{dy}{dx}+\frac{2}{x}y=x\log x$.

SECTION – E

V. Answer **any two** of the following. (2×5=1

19) The Centroid of the triangle is (2, 1, –1). If the co-ordinates of two of its vertices are (1, 2, –1) and (2, 0, 3). Find the co-ordinates of the third vertex.

20) The direction cosines of two lines satisfy the equation $l + m - n = 0$ and $mn + 6ln - 12\,lm = 0$. Find the direction ratios.

21) A line makes angles $\alpha, \beta, \gamma, \delta$ with four diagonals of a cube. Show that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta = \frac{4}{3}$.

22) Find the image of the point (2, –1, 2) in the plane $2x + y + z = 6$.
