SN – 463

(20)

I Semester B.C.A. Degree Examination, November/December 2014
(Y2K8)
BCA 203 : MATHEMATICS
(Equivalent for 1BCA – 2(OS/BCA – 101 (2K7) and BCA – 303 (2K7))

Time : 3 Hours Max. Marks : 90

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

SECTION – A

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

1) Define unit matrix with an example.

2) If $A = \begin{bmatrix} 8 & 2 \\ 6 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 3 & 1 \end{bmatrix}$

Find AB.

3) Define subgroup.

4) Construct the composition table of multiplication mod 10 for the group {1, 3, 7, 9}.

5) Find $\frac{d^n}{dx^n}[\sin 4x \cos 2x]$.

6) If $y = (\sin^{-1}x)^2$ show that $(1 - x^2)\, y_2 - xy_1 - 2 = 0$.

7) Evaluate $\int \frac{1}{\sqrt{4 - x^2}}\, dx$.

8) Evaluate $\int_0^{\frac{\pi}{2}} \sin x\, dx$.

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

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

P.T.O.

11) Find the cosine of the angle between the vectors $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} + 3\hat{j} + 4\hat{k}$.

12) Find the unit vector in the direction of $\hat{i} - 2\hat{j} + \hat{k}$.

13) Find the equation of a line passing through the points A (2, –1, 4) and B (1, 1, – 2).

14) Find the length of the perpendicular from the origin on the plane $6x - 3y + 6z + 7 = 0$.

15) Find a unit vector normal to the plane $x - 2y + 3z + 9 = 0$.

SECTION – B

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

1) Solve using Cramer's rule

$3x - 4y + 5z = -6$

$x + y - 2z = -1$

$2x + 3y + z = 5$

2) Find the Eigen values and the corresponding eigen vectors of the matrix $A = \begin{bmatrix} 5 & -1 \\ 3 & 1 \end{bmatrix}$.

3) Using Cayley- Hamilton theorem find A^{-1} where $A = \begin{bmatrix} 1 & 2 \\ 3 & -2 \end{bmatrix}$.

4) Using the n^{th} derivative of cosx cos2x cos3x.

5) Find the n^{th} derivative of $\dfrac{x}{1 + 3x + 2x^2}$.

6) If $y = e^{m\sin^{-1}x}$ 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 $G = \{0, 1, 2, 3, 4, 5\}$ is an abelian group under addition modulo 6.

8) Prove that $G = \{1, 2, 3, 4\}$ is an abelian group under multiplication modulo 5.

9) Prove that $H = \{1, -1\}$ is a subgroup of the group $G = \{1, -1, i, -i\}$ under multiplication.

10) Find the sine of the angle between the vectors $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 2\hat{k}$.

11) Find the value of m for which the following vectors are coplanar $\vec{a} = 4\hat{i} + 11\hat{j} + m\hat{k}$, $\vec{b} = 7\hat{i} + 2\hat{j} + 6\hat{k}$ and $\vec{c} = \hat{i} + 5\hat{j} + 4\hat{k}$.

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

SECTION – D

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

13) Evaluate $\int \frac{dx}{4x^2 + 4x + 5}$.

14) Evaluate $\int x^2 \tan^{-1} x \, dx$.

15) Show that $\int_0^{\frac{\pi}{2}} \frac{\sin^4 x}{\sin^4 x + \cos^4 x} dx = \frac{\pi}{4}$.

16) Solve $\frac{dy}{dx} = \frac{y}{x} + \tan\left(\frac{y}{x}\right)$.

17) Solve $\frac{dy}{dx} + y \cot x = \sin x$.

18) Test for exactness and hence solve the equation $(2xy + 3y)\, dx + (x^2 + 3x)dy = 0$.

SECTION – E

V. Answer **any two** of the following : **(2×5=10)**

19) The direction cosines of two lines satisfy the equations $l + m + n = 0$ and $l^2 + m^2 - n^2 = 0$. Find the direction ratios.

20) Find the angle between the diagonals of a cube.

21) Show that the points (1, 2, 3), (2, 3, 1) and (3, 1, 2) are the vertices of an equilateral triangle.

22) Find the image of the point (1, 2, 3) in the plane $x + y + z - 10 = 0$.