BCA – 21

II Semester B.C.A. Examination, Feb./March 2010
MATHEMATICS

Time 3 Hours Max. Marks : 80

Instructions *: 1) Answer* ***all*** *questions in Part* ***A****,* ***6*** *out of* ***8*** *questions in Part* ***B****, and* ***3*** *out of* ***5*** *questions in Part* ***C****.*
2) Part ***A*** *: Questions from* ***1*** *to* ***8*** *carry* ***1*** *mark and* ***9*** *to* ***14*** *carry* ***2*** *marks each.*
3) Part ***B*** *:* ***Each*** *question carries* ***5*** *marks.*
4) Part ***C : Each*** *question carries* ***10*** *marks.*

PART – A

1. The identity matrix of order three is of the form _____

2. Define a semi group.

3. The section of a sphere by a plane is _____

4. The n^{th} order derivative of Cos(ax + b) is _____

5. The Reduction formula for $\int_0^{\pi/2} \sin^m x \, dx$ is _____

6. $\int_0^2 (2x+3)^5 \, dx$ _____

7. The necessary and sufficient condition for the equation

   M(x, y)dx + N(x, y)dy = 0 to be exact is _____

8. A square matrix A is said to be singular if |A| = _____

9. If $A=\begin{pmatrix} 1 & -1 & 3 \\ 2 & 3 & 4 \end{pmatrix}$ and $B=\begin{pmatrix} 2 & 3 & 1 \\ 3 & 4 & 2 \end{pmatrix}$ then find 3A – 2B.

P.T.O.

10. Differentiate Sin [$\text{Sin}^{-1}(x^2)$] w. r. t x

11. If $x = at^2$ and $y = 2at$ then find $\frac{d^2y}{dx^2}$

12. Evaluate $\int x \tan^{-1} x \, dx$

13. Verify the condition for exact and hence solve

    $(x + y + \cos x)\, dx + \sin x \, dy = 0$.

14. If $A = \begin{pmatrix} 3 & 1 \\ 2 & 5 \end{pmatrix}$ then find $A^2 - 5A + 13I$.

PART – B

1. Find the eigen values of the matrix

$$A = \begin{pmatrix} 5 & 4 & -4 \\ 4 & 5 & -4 \\ -1 & -1 & 2 \end{pmatrix}$$

2. Find 'a' such that the vectors

   $\vec{A} = 2\hat{i} - \hat{j} + \hat{k}$, $\vec{B} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{C} = 3\hat{i} + a\hat{j} + 5\hat{k}$ are coplanar.

3. Find the equation of the plane which passes through the points

   (2, 1, 1), (9, 0, 6) and perpendicular to the plane $2x + 6y + 6z = 9$.

4. Find the equation of the sphere whose diameter is the line joining the points (4, 0, -2) and (0, 3, 1).

5. Evaluate: $\text{Lt}_{x \to \Pi/4}\ (\text{Tan}x)^{\text{Tan}2x}$

6. Evaluate : $\int \frac{dx}{5+4\cos x}$

7. Solve : $y - x\frac{dy}{dx} = a\left(y^2 + \frac{dy}{dx}\right)$

8. Evaluate : $\int_0^1 \frac{dx}{1-x+x^2}$

PART – C

1. Find the eigen values and eigen vector of the matrix

$$A = \begin{pmatrix} 1 & 2 & 0 \\ 2 & 1 & -6 \\ 2 & -2 & 3 \end{pmatrix}$$

2. If $\vec{A} = 2\hat{i} - \hat{j} + 3\hat{k}$, $\vec{B} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{C} = 3\hat{i} + \hat{j} - \hat{k}$ then find $\vec{A}.(\vec{B} \times \vec{C})$ and $\vec{A} \times (\vec{B} \times \vec{C})$.

3. Find the equation of the plane through the points (2, 2, 1),(1, -2, 3) and parallel to the line joining the points (2, 1, -3) and (-1, 5, -8).

4. If $y = (\text{Sin}^{-1} x)^2$ then P.T $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - n^2y_n = 0$.

5. Solve : $(y^2 + 2xy)\,dx + (2x^2 + 3xy)\,dy = 0$.

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