

**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  $n^{\text{th}}$  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  $\sin [\sin^{-1}(x^2)]$  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

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

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

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

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

5. Evaluate:  $\lim_{x \rightarrow \pi/4} (\tan x)^{\tan 2x}$

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  $\vec{A} \cdot (\vec{B} \times \vec{C})$  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  $y = (\sin^{-1} x)^2$  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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