



BCA  
BlOM

MS – 532

II Semester B.C.A. Degree Examination, May/June 2014

(Y2K8 Scheme) (2008-09 & Onwards)

BCA 203 : MATHEMATICS

(F+R 100 – 2011-12 and Onwards)

(R-90 Prior to 2011-12)

Time : 3 Hours

Max. Marks : 90/100

**Instructions:** 1) Answer **all** Section.

2) Section **F** is applicable to the students who have taken admission in **2011** and Onwards.

SECTION – A

I. Answer **any ten** of the following.

(2x10=20)

1) Define eigen values and eigen vectors.

2) Solve x if 
$$\begin{pmatrix} x^2 & 1 \\ 2 & x \end{pmatrix} + \begin{pmatrix} 2x & 2 \\ -1 & 2 \end{pmatrix} = \begin{pmatrix} -1 & 3 \\ 1 & 1 \end{pmatrix}.$$

3) Define an abelian group.

4) Examine whether  $G = \{0, 1, 2\}$  is a group w.r.t. multiplication mod 3.

5) Find the unit vector along with the vector  $i - 2j - 3k$ .

6) Find  $\vec{i} \times (\vec{a} \times \vec{i})$ .

7) Find the  $n^{\text{th}}$  derivative of  $a^{mx}$ .

8) State Leibnitz's theorem.

9) Evaluate  $\int \tan x \, dx$ .

P.T.O.





- 10) Evaluate  $\int \frac{x^3 + x + 1}{x^2 - 1} dx$ .
- 11) Define an ordinary differential equation with example.
- 12) Solve  $x dy + y dx = dx + dy$ .
- 13) Find the ratio in which the point  $P(5, 4, -6)$  divides the line joining the points  $A(3, 2, -4)$  and  $B(9, 8, -10)$ .
- 14) Find the direction cosine of the line joining the points  $P(4, 3, -5)$  and  $Q(-2, 1, -8)$ .
- 15) The Cartesian equation of the line are  $\frac{x-3}{2} = \frac{y+2}{-5} = \frac{z-6}{4}$ , find the vector equation of the line.

## SECTION - B

II. Answer **any four** of the following.

(5×4=20)

- 16) Solve using Cramer's rule

$$2x - y + z = 6$$

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

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

- 17) Solve using matrix method

$$2x - y + 3z = 9$$

$$x + y + z = 6$$

$$x - y + z = 2$$

- 18) If  $A = \begin{pmatrix} 1 & 2 \\ 2 & -1 \end{pmatrix}$ , find  $A^{-2}$  and  $A^{-3}$ .

- 19) Find the  $n^{\text{th}}$  derivative of  $e^{ax} \sin(bx + c)$ .

- 20) Find the  $n^{\text{th}}$  derivative of  $\frac{x-1}{(x-2)^3(x+2)}$ .

- 21) If  $x = \sin(t)$  and  $y = \cos(pt)$ , prove that  $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2-p^2)y_n = 0$ .





## SECTION - C

III. Answer **any four** of the following.

(5×4=20)

22) Prove that the set given by  $M = \left\{ \begin{pmatrix} x & x \\ x & x \end{pmatrix} \mid x \in \mathbb{R}, x \neq 0 \right\}$  is an abelian group

w.r.t. matrix multiplication.

23) P.T.,  $G = \{1, 5, 7, 11\}$  is a group under multiplication modulo 12.

24) P.T., on  $\mathbb{Q} - \{0\}$ , the operation  $*$  defined by  $a * b = \frac{ab}{3}$  is a group.

25) Using vector method, show that the given points  $A(6, -7, -1)$ ,  $B(2, -3, 1)$  and  $C(4, -5, 0)$  are collinear.

26) Mention any five properties of scalar triple product.

27) Find the volume of the parallelepiped whose co-terminal edges are

$$\vec{a} = i + 2j + 3k; \vec{b} = i - 2j + k; \vec{c} = 3i + 2j + k.$$

## SECTION - D

IV. Answer **any four** of the following.

(5×4=20)

28) Evaluate  $\int \frac{dx}{5 + 4 \cos x}$ .

29) Evaluate  $\int \frac{1}{4x^2 + 4x + 5} dx$ .

30) Evaluate  $\int_1^2 \frac{dx}{\sqrt{2x - x^2}}$ .

31) Solve  $(x^3 - 3xy^2)dx = (y^2 - 3x^2y)dy$ .

32) Solve  $x \frac{dy}{dx} - y = x^3 \cdot \cos x$ ,  $y(\pi) = 0$ .

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





## SECTION - E

V. Answer **any two** of the following.

(5×2=10)

- 34) Show that the points (1, 2, 3), (2, 3, 1) and (3, 1, 2) are vertices of an equilateral triangle.
- 35) Derive the equation of line in vector form and Cartesian form.
- 36) Show that the line joining the points (1, 2, 3) and (4, 5, 7) is parallel to the line joining the points (-4, 3, -6) and (2, 9, 2).
- 37) Show that the points (3, 2, 4), (4, 5, 2) and (5, 8, 0) are collinear and find the equations of the line passing through them.

## SECTION - F

VI. Answer **any two** of the following.

(5×2=10)

- 38) Find the image of the point (-3, 0, 1) in the plane  $4x - 3y + 2z = 19$ .
- 39) Let P(3, 2, 0), Q(5, 3, 2), R(-9, 6, -3) are three points forming a triangle. PM the bisector of the angle QPR meets QR in M. Find the co-ordinates of the point M.
- 40) Evaluate  $\int x^3 \cdot a^x \cdot dx$ .
- 41) Evaluate  $\int_0^{\pi/2} x \cdot \cos^2 x \cdot dx$ .