



SA – 911

II Semester B.C.A. Degree Examination, April/May 2015
(Y2K8 Scheme)
COMPUTER SCIENCE
BCA – 203 : Mathematics
(R 100- 2011-12 and Onwards, R – 90-Prior to 2011-12)

Time : 3 Hours

Max. Marks : 100/90

- Instructions :** 1) Section A, B, C, D and E is common to all students.
2) Section F is applicable to the student 2011-12 onwards.

SECTION – A

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

1) Define eigen values and eigen vectors.

2) Find x, if
$$\begin{vmatrix} x & 3 & -2 \\ 3 & -2 & 5 \\ 0 & 1 & 2 \end{vmatrix} = 0.$$

3) Define a semi group with example.

4) In a group of rational numbers * is defined by $a * b = a + b - ab$. Find the identity and inverse.

5) If $\vec{a} = i - 2j + 3k$ and $\vec{b} = 2i - j - 3k$, Find the projection of \vec{a} on \vec{b} .

6) If $\vec{a} = 3i - j + 3k$ and $\vec{b} = 3i + 2j - k$ Find $\left| \vec{a} + 3\vec{b} \right|$.

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

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

9) Evaluate $\int \log x \cdot dx$.

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

P.T.O.



- 11) Write the order and degree of the differential equation

$$\left(\frac{d^3y}{dx^3}\right)^3 + \left(\frac{d^2y}{dx^2}\right)^5 + \frac{dy}{dx} + y = e^x.$$

12) Solve $\frac{dy}{dx} + \frac{4y+3}{2x+1} = 0.$

- 13) Find the distance between the points (3, 4, -2) and (-4, 2, 5).

- 14) Find the direction cosine of the vector $3i + 4j + k.$

- 15) Find the centroid of a triangle with vertices (3, -2, 4), (5, -4, 5) and (1, 4, 2).

SECTION - B

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

(4×5=20)

- 16) Find the angle between diagonals of a cube.

- 17) Solve $x + y - 2z = 0, 2x - y + z = 2, x + 2y - z = 2$ by matrix method.

- 18) Using the Cayley-Hamilton theorem find the inverse of the matrix

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

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

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

- 21) If $y = \sin(m\sin^{-1}x)$, then 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)

- 22) Prove that $G = \{2, 4, 6, 8\}$ is a group under multiplication modulo 10.

- 23) Prove that $G = \{1, W, W^2\}$ forms an Abelian group under multiplication.

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

- 25) Find the area of the parallelogram whose diagonals are $4i + 2j - k$ and $3i + j + 4k.$



26) Prove that points A(2, 3, -1) B(1, -2, 3) C(3, 4, -2) and D(1, -6, 6) are coplanar.

27) If $\vec{a} = 3i + 2j - 3k$, $\vec{b} = i + 2j - k$ and $\vec{c} = i - 2j + 4k$. Find $\vec{a} \times (\vec{b} \times \vec{c})$.

SECTION - D

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

(4×5=20)

28) Evaluate $\int \frac{dx}{2x^2 + 4x + 9}$.

29) Evaluate $\int x \cos 2x \, dx$.

30) Evaluate $\int_0^{\pi/2} \frac{\cos^6 x}{\cos^6 x + \sin^6 x} \, dx$.

31) Solve $\frac{dy}{dx} = \cos(x + y)$.

32) Solve $(x^2 + 2y^2) \, dx - xy \, dy = 0$.

33) Verify the equation $(4x + 3y + 1) \, dx + (3x + 2y + 1) \, dy = 0$ for exactness and hence solve.

SECTION - E

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

(2×5=10)

34) Find the angle between the lines whose direction ratios are 1, -1, 2 and 1, 0, -3.

35) Find the equation of the plane passing through (1, 1, 1) (1, -1, 1) and (-7, -3, -5).

36) Show that the points (1, 2, 3) and (-3, -1, -1) (5, 5, 7) are collinear. Also find the equation of the line through these points.

37) Find the length and equation of the shortest distance between the z-axis and

the line $\frac{x+1}{3} = \frac{y-2}{4} = \frac{z}{5}$.



SECTION – F
(Section F is applicable to the Student 2011-12 Onwards)

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

38) Find the equation of the sphere which passes through the circle

$$x^2 + y^2 + z^2 - 9 = 0 = 2x + 3y + 4z - 5 \text{ and the point } (1, 2, 3).$$

39) Find the equation of the right circular cone whose axis $\frac{x-1}{-1} = \frac{y-2}{3} = \frac{z-3}{3}$

and a generator is $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$.

40) Evaluate $\int \frac{dx}{4 \cos x + 3 \sin x + 5}$.

41) Mention any 5 properties of scalar triple product.
