



SG – 635

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II Semester B.C.A. Degree Examination, September/October 2021
(Y2K8 Scheme)

COMPUTER SCIENCE

BCA – 203 : Mathematics

(R 100 – 2011 – 12 Onwards and R – 90 Prior to 2011– 12)

Time : 3 Hours

Max. Marks : 100/90

Instructions : 1) Section A, B, C, D and E is compulsory to all Students.
2) Section F is applicable to the student 2011-12 Onwards.

SECTION – A

I. Answer any 10 of the following.



(10×2=20)

1) If $A = \begin{bmatrix} 2 & 4 & 6 \\ 3 & 5 & 7 \end{bmatrix}$ show that $(A')' = A$.

2) Find the inverse of $A = \begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$.

3) Find the n^{th} derivative of $\sin(3x-1)$.

4) Find the n^{th} derivative of $\frac{1}{3x-1}$.

5) Define a group.

6) In a group $G = \{1, 2, 3, 4, 5, 6\}$ with respect to multiplication mod 7, find $3^{-1} \otimes 7^4$.

7) Find the magnitude of the vector $4\hat{i} + 3\hat{j} - 2\hat{k}$.

8) Find the projection of $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ on $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$.

9) Evaluate $\int_0^2 x^3 dx$.

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

11) Write the order and degree of the differential equation $\left(\frac{dy}{dx}\right)^2 + 2y = \sin x$.

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

13) Find the co-ordinates of the point which divides joint of $(-2, 3, 5)$ and $(1, -4, -6)$ in the ratio $2 : 3$ internally.

14) Find the direction ratio's of a line, whose end points are $P(4, 3, -5)$ and $Q(-2, 1, -8)$.

15) Find the angle between the lines whose direction ratio's are $(1, 2, 3)$ and $(3, -1, 2)$.

SECTION - B

II. Answer any 4 of the following.

(4×5=20)

16) Solve by Cramer's rule

$$3x + 4y = -1$$

$$2x - y = 3.$$

17) Solve by matrix method

$$5x + 2y = 4$$

$$7x + 3y = 5.$$

18) Find the eigen value and eigen vectors of $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.

19) Solve the n^{th} derivative of $\cos(ax + b)$.

20) Find the n^{th} derivative of $\sin 3x \cos 2x$.

21) If $y = \tan^{-1}x$, prove that $(1-x^2) y_n + [2(n-1)x - 1] y_{n-1} + (n-2)(n-1) y_{n-2} = 0$.



SECTION – C

III. Answer **any 4** of the following.

(4×5=20)

- 22) Prove that the set of integers x is an infinite group under the operation addition.
- 23) Prove that $G = \{ 1, \omega, \omega^2 \}$ forms an abelian group under multiplication.
- 24) Prove that $H = \{0, 2, 4\}$ is a subgroup of a group $G = \{ 0, 1, 2, 3, 4, 5 \}$ under \oplus_6 .
- 25) Find the area of the parallelogram whose adjacent sides are $\vec{a} = \hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{b} = -3\hat{i} - 2\hat{j} + \hat{k}$.
- 26) Find the unit vector perpendicular to both vectors $3\hat{i} + \hat{j} - 2\hat{k}$ and $2\hat{i} + 3\hat{j} - \hat{k}$.
- 27) Show that vectors $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = 3\hat{i} + 4\hat{j} + 2\hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j} + 5\hat{k}$ are coplanar.

SECTION – D

IV. Answer **any 4** of the following.

(4×5=20)

- 28) Evaluate $\int \frac{x+2}{(x+3)(x+1)} dx$.
- 29) Evaluate $\int x \sin^2 x dx$.
- 30) Evaluate $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$.
- 31) $(3xy + y^2) dx - (x^2 + xy) dy = 0$.
- 32) Solve $(e^y+1) \cos x dx + e^y \sin x dy = 0$.
- 33) Solve $(1+x^2) \frac{dy}{dx} + y = e^{\tan^{-1}x}$.



SECTION – E

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

34) Show that the points $(-2, 6, -2)$, $(0, 4, -1)$, $(-2, 3, 1)$ and $(-4, 5, 0)$ are the vertices of a square.

35) Find the angles between the diagonals of a cube.

36) Show that lines $\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}$ and $\frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8}$ intersect each other and the point of their intersection.

37) Find the image (reflection) of the point $(1, 2, 3)$ in the plane $x + y + z = 9$.

SECTION – F

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

38) Find $\vec{a} \times (\vec{b} \times \vec{c})$ if $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{c} = 2\hat{i} + \hat{j} + 4\hat{k}$.

39) $\int x^2 e^{5x} dx$.

40) Solve $\frac{dy}{dx} = \frac{1}{\cos(x+y)}$.

41) Find the angle between the lines whose direction cosines are given by the equation $l + m + n = 0$ and $l^2 + m^2 - n^2 = 0$.
