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 $\int_0^2 x^3 dx$.

P.T.O.

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 sin3x cos2x.

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

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 $l^2 + m^2 - n^2 = 0$.