D 73137 (Pages : 4) Name...

Reg. No.....................................

FIRST SEMESTER B.A./B.Sc. DEGREE EXAMINATION, NOVEMBER 2019

(CUCBCSS—UG)

B.C.A.

BCA 1C 01—MATHEMATICAL FOUNDATION OF COMPUTER APPLICATIONS

(2014 Admissions)

Time : Three Hours Maximum : 80 Marks

Section A

Answer all the **ten** *questions.*
Each question carries 1 *mark.*

1. Define skew Hermitian Matrix.
2. Define rank of a matrix.
3. If $\vec{a}$ and $\vec{b}$ are perpendicular then $\vec{a} \cdot \vec{b} =$ ————.
4. Derivative of $\log \sin x =$ ————.
5. If u is differentiable and v is integrable functions of x, then $\int uv dx =$ ————.
6. Define antiderivative.
7. Define Characteristic vector of a matrix.
8. State fundamental theorem for integral calculus.
9. Give an example of a second order differential equation of degree 2.
10. Write the general solution if the auxiliary equation has distinct roots λ_1 and λ_2.

(10 × 1 = 10 marks)

Section B

Answer all **five** *questions.*
Each question carries 2 *marks.*

11. If A is an orthogonal matrix, show that $|A| = \pm 1$.
12. Find A^2 where $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.

Turn over

13. Find $\vec{a} \cdot \vec{b}$, where $\vec{a} = \hat{i} + 2\hat{j} - \hat{k}, \vec{b} = 3\hat{i} - \hat{j} + 2\hat{k}$.

14. Solve : $xdx - ydy = 0$.

15. Solve : $\frac{d^2x}{dy^2} - 1 = 0$.

(5 × 2 = 10 marks)

Section C

Answer any **five** *out of eight questions.*
Each question carries 4 marks.

16. Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 1 & 0 & 6 \end{bmatrix}$.

17. Find the eigen values of the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$.

18. Solve : $2xyy' - y^2 + x^2 = 0$.

19. Solve : $\left(D^2 + 6D + 8\right) y = 0$, where $D \equiv \frac{d}{dx}$.

20. Is the system of equations $\begin{aligned} 2x - y + z &= 7 \\ 3x + y - 5z &= 13 \\ x + y + z &= 5 \end{aligned}$ consistent ?

21. Differentiate $y = \frac{x}{\sqrt{2x-1}}$.

22. Evaluate $\int \frac{x-1}{(2x-1)^{3/2}}\,dx$.

23. Evaluate $\int_0^{\frac{\pi}{2}} x \sin x\, dx$.

(5 × 4 = 20 marks)

Section D

Answer any **five** *out of eight questions.*
Each question carries 8 marks.

24. Using matrix method test for consistency and if consistent solve the system of equations

$$x + y + z = 3$$
$$x + 2y + 3z = 4$$
$$x + 4y + 9z = 6.$$

25. Using Gauss elimination method solve the equations :

$$-x_2 + x_3 = -8$$
$$x_1 - 2x_2 - 3x_3 = 0$$
$$-x_1 + x_2 + 2x_3 = 3.$$

26. Find the eigen values and corresponding eigen vectors of the matrix :

$$\begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}.$$

27. Obtain the row reduced echelon equivalent of the matrix A and hence find its rank :

$$A = \begin{bmatrix} 2 & 0 & 1 & -2 \\ -1 & 1 & 2 & 3 \\ 1 & -1 & 2 & 1 \\ 3 & 1 & 0 & -1 \end{bmatrix}.$$

28. Solve (a) Solve $y' - 2y/x = x^2 \cos 3x$; (b) Solve $x \dfrac{dy}{dx} + y = xy^3$.

29. Solve $y'' - 2y' + 2y = e^x \cos 2x$.

30. (a) Find $\dfrac{dy}{dx}$, where $y = \dfrac{x^3 \sqrt{x^2+4}}{\left(x^3+3\right)^{1/3}}$.

(b) Evaluate $\int \dfrac{x\,dx}{\left(x^2+3\right)^2}$.

31. Obtain the partial differential equation representing the family of circles $u = (x-a)^2 + (y-b)^2$.

(5 × 8 = 40 marks)