

D 52770

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Name.....

Reg. No.....

FIRST SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2018

(CUCBCSS—UG)

Complementary Course

BCA 1C 01—MATHEMATICAL FOUNDATION OF COMPUTER APPLICATIONS

(2014 Admissions)

Time : Three Hours

Maximum : 80 Marks

Part A (Objective Type)

Answer all **ten** questions.

Each question carries 1 mark.

1. Give an example of a scalar matrix.
2. What is the value of α if $A = \begin{bmatrix} 1 & -1 \\ \alpha & 3 \end{bmatrix}$ is a singular matrix ?
3. If $|\bar{a}| = 3$, what is $|-2\bar{a}|$?
4. State the product rule of differentiation.
5. State whether the following statement is True or False :
" $|x|$ is derivable at $x = 0$."
6. Evaluate $\int_0^{\pi/2} \cos 2x \, dx$.
7. What is the integral of $\cos x + \sec^2 x$?
8. What is the order of the differential equation $\frac{d^2y}{dx^2} - 2\left(\frac{dy}{dx}\right)^3 + y = 0$?
9. What are the roots of the auxiliary equation of $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = 0$?
10. Obtain a partial differential equation by eliminating the arbitrary constants a and b from the relation $z = (x + a)(y + b)$.

(10 × 1 = 10 marks)

Turn over

Part B (Short Answer Type)

Answer all five questions.

Each question carries 2 marks.

11. Find the value of λ such that the vectors $\vec{a} = 2\vec{i} + 3\vec{j} + 4\vec{k}$ and $\vec{b} = 3\vec{i} + 2\vec{j} - \lambda\vec{k}$ are perpendicular.
12. Find the derivative of \sqrt{x} from the first principle.
13. Evaluate $\int \frac{x-5}{x^2-10x+11} dx$.
14. Solve the initial value problem $xy' + y = 0$, $y(2) = -2$.
15. Solve $(D^2 - 12D + 36)y = e^{6x}$ where $D \equiv \frac{d}{dx}$.

(5 × 2 = 10 marks)

Part C (Short Essay Type)

Answer any five questions.

Each question carries 4 marks.

16. Find the Eigen values of the matrix $\begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$.
17. If $A + B = \begin{bmatrix} 1 & -1 \\ 3 & 0 \end{bmatrix}$ and $A - B = \begin{bmatrix} 3 & 1 \\ 1 & 4 \end{bmatrix}$, find AB .
18. State chain rule of differentiation of composite functions. Using chain rule find $\frac{dy}{dx}$ when $y = \frac{1}{4}v^4$ and $v = \frac{2}{3}x^3 + 5$.
19. Show that $\int_0^{\pi/2} \sin^2 x dx = \int_0^{\pi/2} \cos^2 x dx$ and hence show that each integral is $\frac{\pi}{4}$.

20. Solve $(1+x)ydx + (1-y)xdy = 0$.

21. (i) Write the general form of a first order linear differential equation.

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

22. Solve $\frac{d^2y}{dx^2} + 4y = \sin 3x + e^x + x^2$.

23. Solve $\frac{d^2y}{dx^2} + y = xe^{2x}$.

(5 × 4 = 20 marks)

Part D (Essay Type)

Answer any **five** questions.

Each question carries 8 marks.

24. Find the rank of the matrix $\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 3 & -2 & 1 \\ 2 & 0 & -3 & 2 \\ 3 & 3 & -3 & 3 \end{bmatrix}$ by reducing it to the row reduced echelon form.

25. Test for consistency and if consistent solve the system of equations :

$$\begin{aligned} x + z &= -1 \\ -2x + y &= 1 \\ y + z &= -5. \end{aligned}$$

26. (i) Find from the first principle, the differential co-efficient of $\frac{2x-3}{3x+4}$.

(ii) If $xy = ae^x + be^{-x}$, prove that $x \frac{d^2y}{dx^2} + 2 \frac{dy}{dx} - y = 0$.

Turn over

27. (i) Integrate $\frac{4x}{(x-2)(x-1)}$ by the method of partial fractions.

(ii) Evaluate $\int_0^1 xe^x dx$.

28. Solve $(x^2 - y^2) \frac{dy}{dx} = 2xy$, given that $y = 1$ when $x = 1$.

29. Find the differential equation whose general solution is $y = A \cos(x^2) + B \sin(x^2)$ where A and B are arbitrary constants.

30. Solve $y'' - 3y' + 2y = xe^{3x} + \sin 2x$.

31. Solve $(D^2 - 2D + 1)y = x \sin x$.

(5 × 8 = 40 marks)