

D 92872

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Name.....

Reg. No.....

FIRST SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2015

(CUCBCSS—UG)

Complementary Course

BCA 1C01—MATHEMATICAL FOUNDATION OF COMPUTER APPLICATIONS

Time : Three Hours

Maximum : 80 Marks

Part A (Objective type)

Answer all ten questions.

1. What is the rank of the matrix $\begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$?
2. What is the value of $\vec{a} \times \vec{b}$ if \vec{a} and \vec{b} are parallel vectors?
3. State whether the following statement is true or false : "An additive constant vanishes on differentiation".
4. What is the derivative of $(3x^2 + 2)^2$?
5. Find the integral of $2x^2 - 3x + \frac{1}{x^2}$.
6. Evaluate $\int_0^{\frac{\pi}{2}} \sin x dx$.
7. What is the order of the differential equation $\left(\frac{d^3 y}{dx^3}\right)^2 + 3y = 0$?
8. Write the general form of a first order linear differential equation.

Turn over

9. What are the roots of the auxiliary equation of $\frac{d^2 y}{dx^2} - 5 \frac{dy}{dx} - 6y = 0$?
10. Write a particular integral of $\frac{d^2 y}{dx^2} + 8 \frac{dy}{dx} + 25y = e^{-x}$.

(10 × 1 = 10 marks)

Part B (Short Answer Type)*Answer all five questions.*

11. Find the values of x , y , z and a which satisfy the matrix equation.

$$\begin{bmatrix} x+3 & 2y+x \\ z-1 & 4a-6 \end{bmatrix} = \begin{bmatrix} 0 & -7 \\ 3 & 2a \end{bmatrix}.$$

12. If $f(x) = 7x^{10} + 5x^3 - 3$ find $f'(1)$ and $f'(-1)$.

13. Show that $\int_0^{\pi/2} \sin^2 x dx = \int_0^{\pi/2} \cos^2 x dx$.

14. Solve the initial value problem $y' = -\frac{x}{y}$, $y(1) = \sqrt{3}$.

15. Solve $(D^2 - 5D + 6)y = e^{5x}$ Where $D \equiv \frac{d}{dx}$.

(5 × 2 = 10 marks)

Part C (Short Essay Type)*Answer any five questions.*

16. Find the eigen values of the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$.

17. If $A = \begin{bmatrix} 3 & 3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ find A^{-1} .

18. Find the differential coefficient of $\tan x$, using the first principle.
19. State chain rule of differentiation of composite functions. Using chain rule find $\frac{dy}{dx}$.

When $y = 9u^2$ and $u = 1 - \frac{3}{2}x^2$.

20. Prove that $\int_1^3 (x^2 + x + 3) dx = \int_1^2 (x^2 + x + 3) dx + \int_2^3 (x^2 + x + 3) dx$.

21. Integrate $\frac{5}{(3x-1)(2x+1)}$ using the method of partial fractions.

22. $\frac{dy}{dx} + y \tan x = \cos^3 x$.

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

(5 × 4 = 20 marks)

Part D (Essay Type)

Answer any five questions.

24. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & -1 & 1 & 2 \\ -3 & 0 & 1 & -2 \\ 0 & 1 & 5 & 4 \end{bmatrix}$ by reducing it to the row reduced echelon form.

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

$$\begin{aligned} 2x - y + z &= 7 \\ 3x + y - 5z &= 13 \\ x + y + z &= 5 \end{aligned}$$

26. (i) Differentiate $\sqrt{x^2 + 1} \sin x$.

(ii) Using the quotient rule differentiate $\frac{\sqrt{x} \cos x}{1 + \sec x}$.

27. Evaluate $\int_0^{\pi/2} (\sqrt{\sin \theta}) \cos^5 \theta d\theta$.

28. Solve $\frac{dy}{dx} + 2y = 4x$.

29. Solve $\frac{dy}{dx} + \frac{x - 2y}{2x - y} = 0$.

30. $(D^2 - 3D + 2)y = xe^{3x} + \sin 2x$ Where $D \equiv \frac{d}{dx}$.

31. Form the partial differential equation by eliminating the arbitrary constants a and b from the equation $ax^2 + by^2 + z^2 = 1$.

(5 × 8 = 40 marks)