C 33335 (Pages : 4) Name..................................

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

FIRST SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2017

(CUCBCSS—UG)

Complementary Course

BCA 1C 01—MATHEMATICAL FOUNDATION OF COMPUTER APPLICATIONS

(2014—2016 Admissions)

Time : Three Hours Maximum : 80 Marks

Part A (Objective Type)

Answer all **ten** *questions.*

1. What is the value of $|A|$ if $A = \begin{bmatrix} -3 & 0 & 0 \\ 6 & 4 & 0 \\ -1 & 2 & 5 \end{bmatrix}$?

2. What is the value of α if $A = \begin{bmatrix} 3 & 0 \\ 0 & \alpha \end{bmatrix}$ is a matrix with characteristic values 3 and 5 ?

3. State whether the following statement is true or false ;

   " $|x|$ is derivable at $x = 0$".

4. What is the derivative of $\sin(x^3)$?

5. What is the integral of $x + \frac{1}{x}$?

6. Evaluate $\int_1^2 x^2\, dx$.

7. What is the order of the differential equation $\frac{dy}{dx} = x^2 - 1$?

8. Give an integrating factor for the equation $y' + 2y = 4x$.

Turn over

9. What are the roots of the auxiliary equation of $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 3y = 0$?

10. Write the particular integral of $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} - 10y = 6e^{4x}$.

(10 × 1 = 10 marks)

Part B (Short Answer Type)

Answer all **five** *questions.*

11. Find the value of λ such that the vectors $\vec{a}$ and $\vec{b}$ are perpendicular where $\vec{a} = 2\vec{i} + \lambda\vec{j} + \vec{k}$ and $\vec{b} = 4\vec{i} - 2\vec{j} - 2\vec{k}$.

12. If $f(x) = 3x^3 + 7x^5$ find $f'(2)$.

13. Evaluate $\int_0^2 (2x^2 + 3x + 1)\, dx$.

14. Find the differential equation corresponding to the primitive $x^2 + y^2 + 2ax = 0$.

15. Solve $(D^2 + 1)y = 2\cos x$ 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 $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & 1 & 3 \end{bmatrix}$.

17. If $A = \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$ prove that $A^{-1} = A^T$.

18. Find from the first principle, the differential coefficient of sin $4x$.

19. State chain rule of differentiation of composite functions. Using chain rule find $\frac{dy}{dx}$ when $y = at^2$ and $t = \frac{x}{2a}$.

20. Evaluate $\int e^x \sin x \, dx$ using integration by parts.

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

22. Solve the equation $x\sqrt{1+y^2}\, dx + y\sqrt{1+x^2}\, dy = 0$.

23. Solve $\frac{d^2y}{dx^2} - y = 2 + 5x$.

(5 × 4 = 20 marks)

Part D (Essay Type)

Answer any **five** *questions.*

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

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

25. (i) State the product rule of differentiation and using it find the differential coefficient of $x^3 \sin x$.

(ii) State the quotient rule of differentiation and using it differentiate $\frac{x^2-1}{x^2+1}$.

26. (i) If $\int_a^b x^3\, dx = 0$ and if $\int_a^b x^2\, dx = \frac{2}{3}$, find the values of a and b.

(ii) If $\int_0^a 3x^2\, dx = 8$, find the value of α.

Turn over

27. (i) Find the differential equation whose primitive is $y = Ae^{2x} + Be^{-2x}$.

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

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

29. $(D^2 - 2D + 2)y = e^x x^3$ where $D \equiv \frac{d}{dx}$.

30. Solve $(D^2 + 3D - 10y)y = e^{2x}$ where $D \equiv \frac{d}{dx}$.

31. Form the partial differential equation by eliminating the arbitrary constants a, b and c from the equation $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c} = 1$.

(5 × 8 = 40 marks)