

FIRST SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2016

(CUCBCSS—UG)

Complementary Course

BCA 1C 01—MATHEMATICAL FOUNDATION OF COMPUTER APPLICATION

Time : Three Hours

Maximum : 80 Marks

Part A

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

1. If $A = \begin{bmatrix} 2 & 9 \\ 4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 5 \\ 7 & 2 \end{bmatrix}$ find AB.

2. Prove that $A = \frac{1}{3} \begin{bmatrix} -2 & 1 & 2 \\ 2 & 2 & 1 \\ 1 & -2 & 2 \end{bmatrix}$ is orthogonal.

3. Find $\frac{dy}{dx}$ if $y = \sin^{-1}(\sqrt{x})$.

4. If $y = e^x \log n$, prove that $\frac{dy}{dx} = y + \frac{e^x}{x}$.

5. Evaluate $\int \frac{x^2 - x + 1}{x} dx$.

6. Evaluate $\int_{-1}^{+1} (x^2 + x) dx$.

7. Write the order and degree of the differential equation $y \frac{dy}{dx} = n \left(\frac{dy}{dx} \right)^2 + 5$.

8. Eliminating the arbitrary constant form a differential equation if $y = cx + c^2$.

Turn over

9. Solve $(D^2 - 4D + 4)y = 0$.
10. Write the particular integral of the differential equation $(D^2 - 5D + 6)y = e^x$.

(10 × 1 = 10 marks)

Part B

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

11. Find the inverse of $A = \begin{bmatrix} 3 & 4 \\ 1 & 2 \end{bmatrix}$.

12. Find $\frac{dy}{dx}$ if $y = x^x$.

13. Evaluate $\int_0^1 \frac{1-x}{1+x} dx$.

14. Solve $\frac{dy}{dx} = e^{x-y}$.

15. Solve $\frac{d^4 y}{dx^4} - 5 \frac{d^2 y}{dx^2} + 4y = 0$.

(5 × 2 = 10 marks)

Part C

*Answer any five questions.
Each question carries 4 marks.*

16. Find the rank of $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 7 \\ 3 & 6 & 10 \end{bmatrix}$.

17. Show that $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix} = 0$.

18. Differentiate from 1st principles $y = \sqrt{x}$.
19. If $y = \sqrt{x + \sqrt{x + \sqrt{x + \dots \text{to } \infty}}}$ prove that $\frac{dy}{dx} = \frac{1}{2y - 1}$.
20. Evaluate $\int (x^2 + 3)^4 x \, dx$.
21. Evaluate $\int \frac{2x + 1}{x^2 + x + 1} \, dx$.
22. Solve $(x + y) \, dx + (y - x) \, dy = 0$.
23. Solve $\frac{d^2 y}{dx^2} + 5 \frac{dy}{dx} + 6y = e^x$.

(5 × 4 = 20 marks)

Part D

*Answer any five questions.
Each question carries 8 marks.*

24. Solve using Gauss elimination method :

$$3x + y - z = 3; \quad 2x - 8y + z = -5; \quad x - 2y + 9z = 8.$$

25. Find the eigen values and eigen vectors of :

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

26. (a) Find $\frac{dy}{dx}$ if $x^2 + y^2 = xy$.
- (b) Find $\frac{dy}{dx}$ if $x = at^2$; $y = 2at$.
27. (a) Find the 2nd derivative of $y = x^3 \log x$.
- (b) Find the n^{th} derivative of $y = e^{2x}$.

Turn over

28. Evaluate :

(a) $\int x \log x \, dx.$

(b) $\int \frac{3x+2}{(x-1)(2x+3)} \, dx.$

29. Evaluate $\int_0^a \frac{\sqrt{x}}{\sqrt{x} + \sqrt{a-x}} \, dx.$

30. Solve $\frac{dy}{dx} + \frac{y}{x} = x^3.$

31. Solve $(D^2 - 4D + 4)y = x^2 + e^x.$

(5 × 8 = 40 marks)