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Name.....

Reg. No.....

**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 1<sup>st</sup> 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  $\frac{d^2y}{dx^2} + 5 \frac{dy}{dx} + 6y = e^x$ .

(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 2<sup>nd</sup> derivative of  $y = x^3 \log x$ .

(b) Find the  $n^{\text{th}}$  derivative of  $y = e^{2x}$ .

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