

**19U118B**

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Name: .....

Reg. No.....

**FIRST SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2019**

(Supplementary/Improvement)

(CUCBCSS-UG)

**CC17U BCA1 C01 - MATHEMATICAL FOUNDATIONS FOR COMPUTER APPLICATIONS**

(Mathematics - Complementary Course)

(2017-2018 Admissions)

Time: Three Hours

Maximum: 80 Marks

**PART A**

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

1. Define involutory matrix.
2. What is the rank of an  $n \times n$  non-singular matrix?
3. Write the characteristic equation of  $A = \begin{bmatrix} 8 & -4 \\ 2 & 2 \end{bmatrix}$ .
4. Find the component and length of vector with initial point  $P(6, 2, -3)$  and terminal point  $Q(-1, -1, 2)$ .
5. The system of linear equations  $AX = B$  is ..... If  $A$  and  $[AB]$  have the same rank
6. Find  $\frac{dy}{dx}$  if  $y = \log(\sqrt{x^2 + 1})$ .
7. Evaluate  $\lim_{x \rightarrow 1} \frac{x^2+4}{x+2}$
8. If  $y = e^x \log x$ , prove that  $\frac{dy}{dx} = y + \frac{e^x}{x}$
9. Evaluate  $\int \frac{(x^2+1)^2}{x^3} dx$
10. Evaluate  $\int_a^b \frac{1}{x} dx$

**(10 x 1 = 10 Marks)**

**PART B**

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

11. Find all 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. Find a value of  $\mu$  such that the vectors  $\vec{a}$  and  $\vec{b}$  are perpendicular where

$$\vec{a} = [2, 3, 4] \text{ and } \vec{b} = [3, 2, -\mu]$$

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

14. The slope of a curve at  $(x, y)$  is  $9x$ . It passes through the origin. Show that its equation

$$9x^2 = 2y$$

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

**(5 x 2 = 10 Marks)**

### PART C

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

16. Find the rank of  $A = \begin{bmatrix} 1 & 2 & -1 & 4 \\ 2 & 4 & 3 & 5 \\ -1 & -2 & 6 & -7 \end{bmatrix}$
17. Show that the value of the determinant  $D = \begin{vmatrix} x+1 & x+2 & x+4 \\ x+3 & x+5 & x+8 \\ x+7 & x+10 & x+14 \end{vmatrix}$  is independent of  $x$  and prove that its value is -2.
18. Differentiate from first principle  $\sin x$
19.  $(x+y)^{m+n} = x^m y^n$ ; find  $\frac{dy}{dx}$
20. If  $y = x^4 - 3x^3 + 3x^2 + 5x + 1$ , prove that  $\frac{d^2y}{dx^2}$  is negative, when  $x$  lies between  $\frac{1}{2}$  and 1
21. State chain rule of differentiation of composite functions. Using chain rule find  $\frac{dy}{dx}$ , where  $y = 9u^2$  and  $u = 1 - \frac{3}{2}x^2$
22. Evaluate  $I = \int \frac{x^2}{(x+1)(x+2)^2} dx$
23. Evaluate  $\int \log x dx$

(5 x 4 = 20 Marks)

### PART D

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

24. Find value of 'a' such that  $x + y + z = 3$ ;  $x + 2y + 2z = 6$ ;  $x + ay + 3z = 2$ ; have  
(a) No solution (b) Unique solution
25. Find the eigen values and eigen vector corresponding to any eigen value of the matrix  
 $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$
26. (a) Find  $\frac{dy}{dx}$  if  $x = \frac{2at}{1+t^2}$ ,  $y = \frac{1-t^2}{1+t^2}$  (b) Find  $\frac{dy}{dx}$  when  $y = (1+2x)^x$
27. (a) If  $y = x^3 \log \frac{1}{x}$ , prove that  $\frac{d^2y}{dx^2} - \frac{2}{x} \frac{dy}{dx} + 3x = 0$   
(b) If  $y = x^2 \log_e x^2$ , find  $\frac{d^2y}{dx^2}$ , when  $x = 1$
28. (a) The slope of at any point  $(x, y)$  of a curve is  $\frac{x+1}{y+1}$ . If the curve passes through the origin, find the equation of the curve.  
(b) Evaluate  $\int \frac{x^2+5x+2}{(x+2)(x+3)} dx$
29. (a) Evaluate  $\int x \log x dx$  (b) Evaluate  $\int \frac{\log x}{(1+\log x)^2} dx$
30. Evaluate  $\int_0^{\pi/2} (\sqrt{\sin \theta}) \cos^5 \theta d\theta$
31. Test for consistency and if consistent solve the system of equations  
 $2x - y + z = 7$ ;  $3x + y - 5z = 13$ ;  $x + y + z = 5$ ;

(5 x 8 = 40 Marks)

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