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(8 pages)

Reg. No. : .....

Code No. : 20733 E Sub. Code : CABA 21/  
CASL 21/CAAM 21

B.B.A. (CBCS) DEGREE EXAMINATION,  
NOVEMBER 2024.

Second Semester

Business Administration /Shipping and Logistics/  
Aviation Management – Allied

BUSINESS MATHEMATICS

(For those who joined in July 2021 and 2022 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The slope of a straight line is \_\_\_\_\_.

- (a)  $\frac{y_2 - y_1}{x_2 - x_1}$  (b)  $\frac{y_2 - y_1}{x_1 - x_2}$   
(c)  $\frac{x_2 - y_2}{x_1 - y_1}$  (d)  $\frac{x}{y}$

2. If  $A = (-4, -3)$  and  $B = (-3, 5)$ , the distance between  $AB$  is \_\_\_\_\_.

- (a)  $\sqrt{2}$  (b)  $\sqrt{20}$   
(c)  $\sqrt{55}$  (d)  $\sqrt{65}$

3. A set having no element is called \_\_\_\_\_.

- (a) Null set (b) Void set  
(c) Empty set (d) All the above

4. The set of all distinct subsets of a set is called \_\_\_\_\_.

- (a) Finite set (b) Infinite set  
(c) Power set (d) Void set

5. If  $y = x^5$ ,  $\frac{dy}{dx} =$  \_\_\_\_\_

- (a)  $x^4$  (b)  $5x$   
(c)  $5x^4$  (d)  $\frac{x^4}{4}$

6. Quotient rule of differentiation is \_\_\_\_\_.

- (a)  $\frac{du}{dx} + \frac{dv}{dx}$  (b)  $\frac{du}{dx} - \frac{dv}{dx}$   
(c)  $\frac{v \cdot \frac{du}{dx} - u \cdot \frac{dv}{dx}}{x^2}$  (d)  $\frac{v \cdot \frac{du}{dx} - u \cdot \frac{dv}{dx}}{v^2}$

7. The second order condition for maxima is \_\_\_\_\_.

(a)  $\frac{dy}{dx} = 0$  (b)  $\frac{d^2y}{dx^2} = 0$

(c)  $\frac{d^2y}{dx^2} > 0$  (d)  $\frac{d^2y}{dx^2} < 0$

8.  $\int e^{2x} dx =$  \_\_\_\_\_.

(a)  $e^{2x}$  (b)  $\frac{e^{2x}}{2} + c$

(c)  $e^{2x} + c$  (d)  $\frac{e^{2x}}{2}$

9. A matrix with equal number of rows and columns is called \_\_\_\_\_.

- (a) Square matrix
- (b) Row matrix
- (c) Column matrix
- (d) Symmetric matrix

10. If  $A = \begin{pmatrix} 1 & 4 & 6 \\ 2 & 3 & -2 \end{pmatrix}$ ,  $A^T =$  \_\_\_\_\_.

(a)  $\begin{pmatrix} 1 & 2 \\ 4 & 3 \\ 6 & -2 \end{pmatrix}$  (b)  $\begin{pmatrix} 2 & 3 & -2 \\ 1 & 4 & 6 \end{pmatrix}$

(c)  $\begin{pmatrix} 6 & 1 & 4 \\ -2 & 2 & 3 \end{pmatrix}$  (d)  $\begin{pmatrix} -2 & 6 \\ 3 & 4 \\ 2 & 1 \end{pmatrix}$

PART B — (5 × 5 = 25 marks)

Answer ALL questions by choosing (a) or (b).

11. (a) A road runs North – South and a river runs East- West. A factory is 5 kms North of the river and 3 kms West of the road. Another factory is 4 kms. South of the river and 6 kms East of the road. Find the length of the telephone line connecting the two factories.

Or

- (b) Find the equation of the line passing through (2,-3) and (-4,5).

12. (a) Evaluate : If  $y = x^5 e^x$  and find  $\frac{dy}{dx}$ .

Or

- (b) The cost  $c = 0.00003x^3 - 0.045x^2 + 8x + 25000$   
find marginal cost at 1000 units output.

13. (a) Evaluate  $\int \frac{x}{2x^2 - 3} dx$ .

Or

- (b) Find the minimum of the function  
 $y = 3x^4 + 8x^3 - 90x^2$ .

14. (a) If  $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$  show that  $A^2 - 4A - 5I = 0$ .

Or

- (b) If  $A = \begin{bmatrix} 2 & 3 & -4 \\ 6 & 7 & 8 \end{bmatrix}$   $B = \begin{bmatrix} 6 & -3 & 2 \\ 5 & 0 & 8 \end{bmatrix}$   
 $C = \begin{bmatrix} 1 & 2 & -3 \\ 5 & -4 & 3 \end{bmatrix}$  Find (i)  $A + B - C$   
(ii)  $A - B + C$

15. (a) If  $A = \{1,3,4,5\}$   $B = \{2,3,7,9\}$  are sets and  
 $x = \{1,2,3,4,5,6,7,8,9\}$  is the universal set  
prove that (i)  $(A \cup B)' = A' \cap B'$   
(ii)  $(A \cap B)' = A' \cup B'$ .

Or

- (b) If  $A = \{1,3,4,5\}$  and  $B = \{1,7,8,10\}$ . Find  
(i)  $A \cup B$  and  $A \cap B$  (ii)  $A - B$  (iii)  $B - A$

PART C — (5 × 8 = 40 marks)

Answer ALL questions by choosing (a) or (b).

16. (a) Let two cities be located at (2, 1) and (8, 9) be  
connected by the straight line road. Let the  
third city be located at (4, 7). Find the point on  
the road which should be connected to the  
third city if the distance from the road is least.

Or

- (b) A company expects that total fixed cost will be  
Rs. 25,000 and the variable cost will be  
Rs. 75,000 on the sales of Rs. 1,25,000. Find the  
(i) Relationship between the sales and cost  
(ii) Break Even point  
(iii) What will be the profit for a sales of  
Rs. 1,00,000.

17. (a) Find the marginal revenue at price 6 units when the demand function is given by  $x = p^{0.2}e^{-0.3p}$ . Prove that marginal revenue is 0 when  $p = 0$  or  $p = 4$ .

Or

- (b) Derive the product rule of differentiation.
18. (a) The demand and supply functions under pure competition are  $y = 16 - x^2$  and  $y = 2x^2 + 4$ . Find the consumer's surplus and producer's surplus.

Or

- (b) A box with a rectangular bottom and no top is to be made from a rectangular piece of material 30 cms long and 16 cms wide by cutting equal sized square corners, then turning up the sides. What should be the dimension of the squares if the box is to have maximum volume?

19. (a) Solve

$$5x + 3y + 7z = 4$$

$$3x + 20y + 2z = 9$$

$$7x + 2y + 11z = 5$$

Using matrix inversion

Or

- (b) Find the rank of  $\begin{bmatrix} -2 & 1 & 3 & 4 \\ 0 & 1 & 1 & 2 \\ 1 & 3 & 4 & 7 \end{bmatrix}$ .

20. (a) A survey discloses that 20 students are interested in music, 15 are interested in photography and 10 like sports. Further 15 are interested in music and photography, 5 are interested in music and sports and 3 are interested in photography and sports and 2 are interested in all the three. Find out the total number of students.

Or

- (b) If  $A = \{1, 2, 3, 4\}$ ,  $B = \{3, 4, 5, 6\}$  and  $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$  then verify that
- (i)  $A - B = A \cap B' = B' - A'$
- (ii)  $(A - B) \cup (B - A) = (A \cup B) - (A \cap B)$ .