SRI VINAYAGA TUITION CENTRE

ANAIMALAI-642104

FIRST MID TEST -2024

BUSINESS MATHEMATICS & STATISTICS

Total Marks: 50 Marks Class: 12

Duration: 1 Hrs 30 Min

PART- A

Choose the correct answers 10 X 1 = 10

1. If the rank of the matrix $\begin{bmatrix} \lambda & -1 & 0 \\ 0 & \lambda & -1 \\ -1 & 0 & \lambda \end{bmatrix}$ is 2. Then λ is

   a) 1 b) 2
   c) 3 d) only real number

2. If $A = \begin{bmatrix} 2 & 0 \\ 0 & 8 \end{bmatrix}$ then ρ(A) =

   a) 0 b) 1 c) 2 d) n

3. The rank of the unit matrix of order n is

   a) n −1 b) n c) n +1 d) n^2

4. If |A| ≠ 0, then A is

   a) non- singular matrix b) singular matrix
   c) zero matrix d) none of these

5. $\Gamma(1)$ is

   a) 0 b) 1 c) n d) n!

6. $\int \frac{2x+3}{\sqrt{x^2+3x+2}}dx$ is

   a) $2\sqrt{x^2+3x+2}+c$ b) $\sqrt{x^2+3x+2}+c$
   c) $\log(x^2+3x+2)+c$ d) $\frac{2}{3}(x^2+3x+2)^{\frac{3}{2}}+c$

7. $\int e^{2x}[2x^2+2xdx]$

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

8. When $x_0 = 2$ and $P_0 = 12$ the producer's surplus for the supply function $P_s = 2x^2 + 4$ is

   a) $\frac{31}{5}$ units b) $\frac{31}{2}$ units
   c) $\frac{32}{3}$ units d) $\frac{30}{7}$ units

9. For a demand function p, if $\int \frac{dp}{p} = k\int \frac{dx}{x}$ then k is equal to

   a) η_d b) $-\eta_d$
   c) $\frac{-1}{\eta_d}$ d) $\frac{1}{\eta_d}$

10. For the demand function p(x), the elasticity of demand with respect to price is unity then

    a) revenue is constant b) cost function is constant
    c) profit is constant d) none of these

PART B

Answer any 5 questions (Q.no 17 compulsory) 5 X 2 = 10

11. Find the rank of the matrix $\begin{bmatrix} -5 & -7 \\ 5 & 7 \end{bmatrix}$

12. Solve the following equations by using Cramer's rule 2x + 3y = 7; 3x + 5y = 9

13. Evaluate $\int \sqrt{2x+1}dx$

14. Evaluate : $\int \frac{dx}{x^2-3x+2}$

15. Find the area bounded by y = 4x + 3 with x- axis between the lines x = 1 and x = 4
16. The price elasticity of demand for a commodity is $\frac{p}{x^3}$. Find the demand function if the quantity of demand is 3, when the price is Rs.2.
17. Solve the system by Cramer' rule, 4 x – 3y = 11; 6 x + 5 y = 7

PART C

Answer any 5 questions (Q.NO 24 COMPULSORY) 5 X 3 = 15

18. Find the rank of the matrix A = $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{bmatrix}$
19. Solve the following equations by using Cramer's rule 2x + y − z = 3, x + y + z = 1, x − 2y − 3z = 4
20. Consider the matrix of transition probabilities of a product available in the market in two brands A and B. $\begin{bmatrix} 0.9 & 0.1 \\ 0.3 & 0.7 \end{bmatrix}$ Determine the market share of each brand in equilibrium position.
21. Integrate the following with respect to x : $\frac{4x^2+2x+6}{(x+1)^2(x-3)}$
22. Evaluate $\int_1^2 \frac{1}{(x+1)(x+2)}dx$
23. If the supply function for a product is p = 3x + 5x^2 .Find the producer's surplus when x = 4.
24. The demand function of a commodity is y = 36 − x^2 . Find the consumer's surplus for y_0 = 11

PART D

Answer all the questions (either or type) 3 X 5 = 15

25. a) Investigate for what values of 'a' and 'b' the following system of equations x + y + z = 6, x + 2y + 3z = 10, x + 2y + az = b have
(i) no solution
(ii) a unique solution
(iii) an infinite number of solutions.

(Or)

b) A firm has the marginal revenue function given by MR = $\frac{a}{(x+b)^2}$ - c where x is the output and a, b, c are constants. Show that the demand function is given by $\frac{a}{b(p+c)} - b$

26. a) Evaluate the following : $\int_0^2 f(x)dx$ where f(x) = $\begin{cases} 3-2x-x^2, & x \le 1 \\ x^2+2x-3, & 1 < x \le 2 \end{cases}$

(Or)

b) A total of Rs.8,500 was invested in three interest earning accounts. The interest rates were 2%, 3% and 6% if the total simple interest for one year was Rs.380 and the amount invested at 6% was equal to the sum of the amounts in the other two accounts, then how much was invested in each account? (use Cramer's rule).

27. a) The price of a machine is Rs.5,00,000 with an estimated life of 12 years. The estimated salvage value is Rs.30,000. The machine can be rented at Rs.72,000 per year. The present value of the rental payment is calculated at 9% interest rate. Find out whether it is advisable to rent the machine.($e^{-1.08}$ = 0.3396) .

(Or)

b) Evaluate : $\int \frac{dx}{x(x^3+1)}$

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