

SRI VINAYAGA TUITION CENTRE

ANAIMALAI

JUNE MONTHLY TEST 2024

BUSINESS MATHEMATICS & STATISTICS

Total Marks: 50 Marks

Class: 12

Duration: 1 Hrs 30 Min

PART A

CHOOSE THE CORRECT ANSWER

10 X 1 = 10

1. If $A = \begin{bmatrix} 2 & 0 \\ 0 & 8 \end{bmatrix}$ then $\rho(A) =$
 - a) 0
 - b) 1
 - c) 2
 - d) n
2. 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
3. The rank of $m \times n$ matrix whose elements are unity is
 - a) 0
 - b) 1
 - c) m
 - d) n
4. The rank of the unit matrix of order n is
 - a) n - 1
 - b) n
 - c) n + 1
 - d) n²
5. Cramer's rule is applicable only to get an unique solution when
 - a) $\Delta_z \neq 0$
 - b) $\Delta_x \neq 0$
 - c) $\Delta \neq 0$
 - d) $\Delta_y \neq 0$
6. For the system of equations $x + 2y + 3z = 1$, $2x + y + 3z = 2$, $5x + 5y + 9z = 4$
 - a) there is only one solution
 - b) there exists infinitely many solutions
 - c) there is no solution
 - d) None of these
7. Rank of a null matrix is
 - a) 0
 - b) -1
 - c) ∞
 - d) 1
8. If $\rho(A) = \rho(A,B)$ the number of unknowns, then the system is
 - a) Consistent and has infinitely many solutions
 - b) Consistent and has a unique solution
 - c) inconsistent
 - d) consistent
9. The rank of the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$ is
 - a) 0
 - b) 1
 - c) 2
 - d) 3
10. The rank of the diagonal matrix $\begin{bmatrix} 1 & & & & \\ & 2 & & & \\ & & -3 & & \\ & & & 0 & \\ & & & & 0 \\ & & & & & 0 \end{bmatrix}$
 - a) 0
 - b) 2
 - c) 3
 - d) 5

PART B

Answer any 4 questions (Q.NO 16 compulsory)

4 X 2 = 8

11. Find the rank of the matrix $\begin{bmatrix} 1 & 5 \\ 3 & 9 \end{bmatrix}$
12. Show that the equations $x + y = 5$, $2x + y = 8$ are consistent and solve them.
13. Show that the equations $3x - 2y = 6$, $6x - 4y = 10$ are inconsistent.

14. Find the rank of each of the following matrices $\begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$
15. Find the rank of the matrix $A = \begin{bmatrix} 4 & 5 & 2 & 2 \\ 3 & 2 & 1 & 6 \\ 4 & 4 & 8 & 0 \end{bmatrix}$
16. Solve the following equations by using Cramer's rule $2x + 3y = 7$; $3x + 5y = 9$

PART C**Answer any 4 questions (Q.NO 22 Compulsory)**

4 X 3 = 12

17. Find the rank of the matrix $\begin{bmatrix} 5 & 3 & 0 \\ 1 & 2 & -4 \\ -2 & -4 & 8 \end{bmatrix}$
18. Show that the equations $x - 4y + 7z = 14$, $3x + 8y - 2z = 13$, $7x - 8y + 26z = 5$ are inconsistent.
19. Find k, if the equations $x + y + z = 7$, $x + 2y + 3z = 18$, $y + kz = 6$ are inconsistent.
20. Solve by Cramer's rule $x + y + z = 4$, $2x - y + 3z = 1$, $3x + 2y - z = 1$
21. 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.
22. Solve the equations $x + 2y + z = 7$, $2x - y + 2z = 4$, $x + y - 2z = -1$ by using Cramer's rule.

PART D**ANSWER THE FOLLOWING QUESTIONS**

4 X 5 = 20

23. a) Show that the equations $x + y + z = 6$, $x + 2y + 3z = 14$, $x + 4y + 7z = 30$ are consistent and solve them.

(Or)

$$\begin{bmatrix} 1 & 2 & -1 & 3 \\ 2 & 4 & 1 & -2 \\ 3 & 6 & 3 & -7 \end{bmatrix}$$

- b) Find the rank of each of the following matrices
24. a) The total number of units produced (P) is a linear function of amount of over times in labour (in hours) (l), amount of additional machine time (m) and fixed finishing time (a)
 i.e, $P = a + bl + cm$

From the data given below, find the values of constants a, b and c

Day	Additional Machine	Production(in Units P)	Labour (in Hrs l)	Time (in Hrs m)
Monday		6,950	40	10
Tuesday		6,725	35	9
Wednesday		7,100	40	12

Estimate the production when overtime in labour is 50 hrs and additional machine time is 15 hrs.

(Or)

- b) The price of three commodities X, Y and Z are x, y and z respectively Mr. Anand purchases 6 units of Z and sells 2 units of X and 3 units of Y. Mr. Amar purchases a unit of Y and sells 3 units of X and 2 units of Z. Mr. Amit purchases a unit of X and sells 3 units of Y and a unit of Z. In the process they earn Rs.5,000/-, Rs.2,000/- and Rs.5,500/- respectively Find the prices per unit of three commodities by rank method.
25. a) Find the rank of each of the following matrices $\begin{bmatrix} 3 & 1 & -5 & -1 \\ 1 & -2 & 1 & -5 \\ 1 & 5 & -7 & 2 \end{bmatrix}$

(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).

26. a) Show that the following system of equations have unique solution: $x + y + z = 3$, $x + 2y + 3z = 4$, $x + 4y + 9z = 6$ by rank method.

(Or)

b) Two newspapers A and B are published in a city. Their present market shares are 15% for A and 85% for B. Of those who bought A the previous year, 65% continue to buy it again while 35% switch over to B. Of those who bought B the previous year, 55% buy it again and 45% switch over to A. Find their market shares after two years.

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