[Time: 2½ Hours] [Marks:75]

Please check whether you have got the right question paper.

N.B: 1. All questions are compulsory
2. In Q.1 attempt both the sub-parts A&B.
3. Figures to the right indicate marks.
4. Use of non-programmable calculator is allowed.

Q.1 Attempt both subparts A& B:

(A) Write the appropriate answer (Any Eight): **08**

1. Given, Principal = Rs.1500, Number of years=3, Interest=Rs.225, then the rate of Simple Interest will be:
   i.   3 %pa
   ii.   4 %pa
   iii. 5 %pa
   iv.   6 %pa

2. The point of no profit no loss is known as :
   i.   Equator
   ii.   Break Even Point
   iii. Null point
   iv.   Variable point

3. The number of ways in which 3 boys and 4 girls can be arranged in a row so that all the three boys are together are:
   i.   3! x 4!
   ii.   5! x 3!
   iii. 7!
   iv.   None of the above

4. A square matrix whose determinants is zero is called:
   i.   Singular
   ii.   Non singular
   iii. Scalar
   iv.   Identity

5. For matrix multiplication, the number of Columns of first matrix should be_____ number of rows of Second Matrix:

   i.   Less than
   ii.   Equal to
   iii. More than
   iv.   Square of

6. The determinant value, of a 2x2 matrix, and its transpose are _____
   - i. the same
   - ii. never the same
   - iii. 2 Dimensional
   - iv. 3 Dimensional

7. The derivative of $x^2 \log x$
   - i. $x^2 \log x$
   - ii. $1+ 2 \log x$
   - iii. $2 \log x$
   - iv. None of the above

8. The extra revenue that an additional unit of a product will earn is called:
   - i. Conditional Revenue
   - ii. Marginal Revenue
   - iii. Elastic Revenue
   - iv. Average Revenue

9. The pre-condition in the method of finite differences is that values of the arguments are :
   - i. equidistant
   - ii. non equidistant
   - iii. logarithmic
   - iv. exponential

10. While finding the difference of two successive entries in the forward difference table, the upper number is always _____ the lowest number:
    - i. added to
    - ii. subtracted from
    - iii. divided from
    - iv. multiplied to

(B) Match the columns (Answer Any Seven):   **07**

	column A		column B
i.	Sinking Fund	a)	Demand>Supply
ii.	Scalar Matrix	b)	When a matrix is equal to its transpose
iii	Stationary Point	c)	maxima
iv	Equilibrium Point	d)	Total Revenue/Total Quantity
v	Identity Matrix	e)	Δ
vi	f'(x)<0 at critical point	f)	Point at which dy/dx=0
vii	Forward difference operator	g)	Neither maxima nor minima
viii	Average Revenue	h)	Type of annuity that can be used to replace a depreciating asset
ix	Point of Inflection	i)	A. A^{-1}
x	Symmetric Matrix		Demand = Supply
		k)	When a matrix is equal to its inverse
		l)	$\begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$

Q.2 A Mr. Valia invested some money at a certain rate of simple interest per annum. The total amounts received by him were Rs.7654.4 in 2 years and Rs.7948.8 in 4 years respectively. Find the principal and the rate of simple interest. **08**

B A manufacturer has invested Rs.30,000 as fixed cost and a variable cost of Rs.20 per unit for production of toys. If each toy can be sold at Rs.40. find the Cost function, Revenue Function and Profit Function. Also find the number of toys to be produced to achieve the Break Event point. **07**

OR

Q.2 P Find the amount at the end of one year of an annuity of Rs.500 payable quarterly, rate of interest being 16% p.a. **08**

Q. The staff of a department consists of a manager, an officer and 10 clerks. A committee of 4 to be selected from this department. Find the number of ways in which this can be done so as to always include: **07**
    i.   the Manager
    ii.   the Manager but not the officer.

Q.3 A (i) Find matrix X if: **08**

$Y = \begin{bmatrix} 3 & 2 \\ 0 & 4 \end{bmatrix}$ and $2X+Y = \begin{bmatrix} 1 & 0 \\ -3 & 2 \end{bmatrix}$

(ii) Find matrices X and Y if:

$X+ Y = \begin{bmatrix} 7 & 10 \\ 2 & 5 \end{bmatrix}$ and $X-Y = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$

B Solve the following equations using Cramer's Rule: **07**

$x + y + z - 7 = 0$
$x + 2y + 3z - 16 = 0$
$x + 3y + 4z - 22 = 0$

OR

Q.3 P Find by Adjoint method the inverse of $A = \begin{bmatrix} 2 & 3 & 4 \\ 1 & 2 & 3 \\ 3 & 5 & 9 \end{bmatrix}$ **08**

Q For the following 2 industry input-output model, find Technology matrix. Also calculate the level of output, if final demand of each product increases by 60 units. Further find the labor requirement for this output. **07**

Industry	Consumption of Industry		Final Demand	Total output
	1	2		
1	120	130	150	400
2	120	180	200	500
Labour	80	200		

Q.4 **A** A company produces x items at a total cost of Rs. (70 + 2x). The demand function is P=100-x, where P is the price and x is the demand. Find the value of x for which: **08**
    i.   Total Revenue is increasing
    ii.   Total Profit is increasing.

B Applying Newton's Backward Interpolation Formula, obtain a polynomial function to fit the following data: **07**

x	30	35	40	45
y=f(x)	38	30	24	20

OR

P Using derivatives, divide 30 into two parts so that their product is maximum. **08**

Q. A farmer noted the following figure for the quantity of fertilizer (in kg) used on his plot of land and the yield (in kg) of wheat from the plot. **07**

Fertilizer (kg)	2	3	4
Yield (kg)	24	32	32

Applying Newton's Forward Interpolation Formula, determine the optimum amount of fertilizer for the plot and the maximum yield expected.

Q.5   A) A manufacturer can sell x items per month at a price p=200-2x. The cost of production is given by C=2x + 1200. Find the Average Profit and the marginal profit when x=10. **08**

    B) Ms. Agarwal has taken a Loan of Rs.11,000 at 10% p.a. to buy gold ornaments. If the amount is to be returned in 6 monthly installments, find the EMI she has to pay. Also prepare the amortization table for the first 2 months. **07**

OR

    C) Attempt any 3: **15**
      1. Explain the difference between Permutations and Combinations.
      2. With an example, explain Upper Triangular Matrix, Lower Triangular Matrix and Skew Symmetric Matrix.
      3. State and explain any two properties of determinants.
      4. Write a short note on Price Elasticity of Demand.
      5. Explain the importance of Business Mathematics in Management.

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