Q.P. Code :03951

[Time: $2\frac{1}{2}$ 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: 08

A) Write the appropriate answer (Any Eight)

1. A fund formed by periodically setting aside money for the gradual repayment of a debt or replacement of a depreciating asset is known as:
   a) Resource Fund
   b) Emergency Fund
   c) Contingency Fund
   d) Sinking Fund
2. In EMI calculations, the rate of interest is compounded:
   a) Quarterly
   b) Yearly
   c) Monthly
   d) Six Monthly
3. A _____ is an arrangement of all or part of a set objects in a definite order.
   a) Permutation
   b) Function
   c) Combination
   d) Factorial
4. The point at which profit is zero is called the:
   a) Zero point
   b) Break Even Point
   c) Odd Even Point
   d) Nominal Point
5. If the order of matrix A is m×p and the order of matrix B is p×n. then the order of matrix AB is:
   a) m x n
   b) n x m
   c) n x p
   d) m x p
6. inverse of a square matrix is possible only if its determinant is:
   a) Zero
   b) Non Zero
   c) Sub Zero
   d) Almost Zero
7. Derivative of 'y' with respect of 'x' represents:
   a) Rate of change of y with respect to x
   b) Historical value of y with respect to x
   c) Distance of y with respect to x
   d) None of the above
8. The derivative of a derivative is called _____.
   a) Anti-derivative
   b) Second order derivative
   c) Secondary derivative
   d) Super derivative

9. In Newton's Forward difference formula, what is u _____
   a) $u=(x-x_0)/h$
   b) $u=(x-x_n)/h$
   c) $u=(x-x^2)/h$
   d) $u=(x-h)/h$
10. Interpolation is the process of:
   a) obtaining value of f(x) at points between the tabular values
   b) obtaining value of f(x) at points beyond, either end of the tabular values
   c) both of the above
   d) none of the above

B) State whether the statements are True or False. (answer Any Seven) 07

1. Given P=Rs. 1500, N=3 years, I=Rs. 195, then simple interest rate will be 4.33% p. a.
2. The point where market demand equals market supply at the same price is called Balancing point.
3. An annuity in which the number of payments is fixed is called fixed Annuity.
4. When a matrix is its own transpose, such a matrix is called a skew symmetric matrix.
5. The value of a determinant is unchanged if its rows and columns are interchanged.
6. In input-output analysis, (I-A) is called the technology matrix.
7. If total cost is known, then the cost of producing one additional unit is called average cost.
8. n! = n(n-1) !
9. At a stationary point, $\frac{dy}{dx} \neq 0$.
10. Newton's interpolation Methods are applicable only when the differences between the independent variables are varying.

Q.2 A) Find the equilibrium quantity and equilibrium price in the following cases: 08

a. Given supply and demand equations, $p=\frac{2x}{100}+2$ *and* $p=\frac{-8x}{100}+12$ respectively.
b. Given supply and demand equation of a product are $x_s=4p+4$ and $x_d=100-8p$ respectively.

B) Vista industries create a fund to replace its present machinery with a new one in 8 years. The estimated cost of the new machinery at that time would be Rs. 21 lakh. The estimated scrap value of the present machinery after 8 years would be Rs. 1 lakh. Determine the amount to be deposited in the fund every quarter at 9% p. a. compounded quarterly. (Given $1.0225^{32}=2.038$) 07

OR

Q.2 P) The difference between the compound interest and simple interest on a certain principal amount for 2 years is Rs. 76.8. the simple interest on the same principal for 4 years is Rs. 3,840. Find the principal amount and the rate of interest. 08

Q) There are 7 men and 3 ladies. Find the number of ways in which a committee of 6 can be formed from these, if the committee is to include at least 2 ladies. 07

Q.3 A) The input-output table for a two sector economy is given below: 08

Producing sector	Consuming Sector		Final Demand
	S_1	S_2	
S_1	20	15	65
S_2	25	20	75

Find:

i. Leontief Matrix
ii. The total output from each of the sectors to meet a final demand for 80 units of S_1 and 100 units of S_2

B) If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}$, where $i^2 = -1$. Verify that $(A+B)^2 = A^2 + B^2$ 07

OR

Q.3 P) Given $A^{-1} = \begin{pmatrix} 5/7 & 1/7 \\ 3/7 & 2/7 \end{pmatrix}$, using adjoint method find A and evaluate $A^2 + 2A$. 08

Q) Solve the following equations using Cramer's Rule: 07

$2x + y + z = 7$
$3x - y - z = -2$
$x + 2y - 3z = -4$

Q.4 A) A company has examined its cost structure and revenue structure and has determined that C the total cost, R total revenue and x the number of units produced are related as : $C=100+0.015x^2$ and $R=3x$ 08

i. Write the Profit function
ii. Find the production rate x that will maximize the profits of the company
iii. Find the maximum profit.

B) Find the equation of the curve y=f(x), where f(x) is a second degree polynomial in x, passing through (0,3), (1,5), (2,9), (3,15) using Newton's backward Difference Interpolation method. 07

OR

Q.4 P) Answer the following: 08

a. Show that the function $y=x^2-2x+3$ has a minima at x=1. Find the minimum value of the function.
b. Show that the function $y=100+15x-3x^2$ has a maxima at x=5/2. Find the maximum value of the function.
c.

Q) For the data given below, find f(2.5) using Newton's Forward Difference interpolation formula: 07

x	1	3	5	7
f(x)	0	25	86	201

Q.5 Attempt either A or B:

A) 1. Mr. Vijay takes a loan of Rs. 80,000 at 9% p. a. to be repaid in 6 monthly installments. Calculate the EMI and prepare the amortization table of repayment. 08

2. The demand function for a commodity is given by $x=200-6p^2$. Find the price elasticity of demand when p=5. 07

OR

B) Attempt **any three**: 15

1. Bring out the difference between simple interest and compound interest
2. Write a note on linear function, exponential function and Logarithmic function
3. With an example, explain Scalar Matrix and Upper Triangular Matrix
4. Explain the terms Present value and Future value in Annuity
5. Explain the applications of Derivatives in Business Management.