Total No. of Questions—4]   [Total No. of Printed Pages—4

Seat
No.

[5304]-107

M.A. (Part-I) (First Semester) EXAMINATION, 2018

ECONOMICS

(EC-107 Mathematical Economics)

(2008 PATTERN)

Time : Three Hours   **Maximum Marks : 80**

N.B. :— (*i*)   Attempt *All* questions.

(*ii*)   Figures to right indicate full marks.

(*iii*)   Answer should be percised and to the point.

(*iv*)   Use of non-programmable calculator is allowed.

1.   Attempt any *one* out of two :   [20]

(*a*)   Given the matrix :

$$X = \begin{bmatrix} 1 & 4 & 2 \\ -1 & 2 & 1 \\ 1 & 3 & 2 \end{bmatrix}$$

show that $XX^{-1} = I_3$.

(*b*)   Given the demand function of two commodities as :

$$Q_1 = 2000 + \frac{400}{P_1 + 3} - 50\, P_2$$

$$Q_2 = 2000 - 100\, P_2 + \frac{500}{P_1 + 4}$$

P.T.O.

(*i*)   Find the nature of commodity

(*ii*)   Calculate the four partial elasticites of demand at P_1 = 5, P_2 = 1.

2.   Attempt any *one* of the following :   [20]

(*a*)   Let '*x*' be the number of units produced of some commodity and let C(*x*) and R(*x*), be the total costs and total revenue to produce '*x*' items. Suppose that for $x \geq 0$, $C(x) = \dfrac{x^3}{3} - 4x^2 + 10x$ and $R(x) = 10x - 2x^2$. Hence the profit 'P' is given by P(*x*) = R(*x*) – C(*x*), therefore :

(*i*)   Determine 'P' as a function of (*x*)

(*ii*)   Find the demand at which P is maxmium.

(*iii*)   What is the maxium profit ?

(*b*)   Explain the concept of consumer's surplus, what data would you require to determine this when there is pure compelition and monpoly. Give reasons.

(*c*)   The demand and supply laws for a commodity are P*d* = $5 - x^2$ and P*s* = $2x - 3$. Find the consumer surplus and prducers surplus at equilibrium price.

3.   Attempt any *two* of the following :   [20]

(*a*)   Assume the marginal cost function of a firm is MC = (log *x*). Find the total cost function when the cost of producing one unit is Rs. 20.

(*b*) A manufacturer earns Rs. 4500 in the first month and Rs. 6000 in the second month. On plotting these points the manufacturer observes a linear function may fit the data.

   (*i*) Find the linear function that hits the data.

   (*ii*) Using your model make prediction of the earrings for the third month.

(*c*) A profit making company wants to launch a new product. It observes that the fixed cost of the new product is Rs. 35000, and the variable cost per unit is Rs. 500. The revenue function for the sale of '*x*' units is given by $5000\ x - 100x^2$. Find :

   (*i*) Profit function

   (*ii*) Break even point

   (*iii*) The values of '*x*' that result in a loss.

(*d*) Solve the following system of equations by matrix invession method.

$$x + y + z = 3$$
$$x + 2y + 3z = 4$$
$$x + 4y + 9z = 6$$

4. Attempt any *four* out of six : [20]

(*a*) Find the derivatives of :

   (*i*) $\dfrac{x-1}{x+1}$

   (*ii*) $(x - 3)\ (x + 1)$

   (*iii*) $(5x + 4)^5$.

(*b*)   Find the elasticities of TC and AC of the function :

$$C = 2x^2 + 4x + 3$$

(*c*)   Evaluate :

$$\int \frac{dx}{x(x^n + 1)}.$$

(*d*)   A publishing house finds that the costs of production directly attributed to each book is Rs. 30, and that the fixed costs are 15,000. If each book can be sold for Rs. 45, then determine :

   (*i*)   The cost function

   (*ii*)   The revenue function

   (*iii*) The profit function

   (*iv*)   Break even point.

(*e*)   If :

$$A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 0 & 2 \\ 1 & -3 & -1 \end{bmatrix}, B = \begin{bmatrix} 4 & 5 & 6 \\ -1 & 0 & 1 \\ 2 & 1 & 2 \end{bmatrix}$$

$$C = \begin{bmatrix} -1 & -1 & 1 \\ -1 & 2 & 3 \\ -1 & -2 & 2 \end{bmatrix}$$

   Find A + B − C.

(*f*)   If C = $0.01x^2$ + 5x + 100 is a cost function, find the average cost function, at what level of production 'x' is there a minimum average cost ? What is this minimum ?