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M.A. (Part I) (First Semester) EXAMINATION, 2017

ECONOMICS

EC-107 : Mathematical Economics

(2008 PATTERN)

Time : Three Hours

N.B. :- (i) Attempt All questions.

(ii) Figures to the right indicate full marks.

(iii) Answers should be precise and to the point.

- (iv) Draw neat diagrams wherever necessary.
- (v) Use of non-programmable calculator is allowed.
- 1. Answer the following questions (any one) : [20]
 - (i) Let

$$A = \begin{bmatrix} 2 & -3 \\ & \\ -7 & 5 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 0 \\ & \\ 2 & -4 \end{bmatrix}$$

Verify that :

- $(a) \quad (2A)^{T} = 2A^{T}$
- $(b) \quad (\mathbf{A} + \mathbf{B})^{\mathrm{T}} = \mathbf{A}^{\mathrm{T}} + \mathbf{B}^{\mathrm{T}}$
- $(c) \qquad (\mathbf{A} \mathbf{B})^{\mathrm{T}} = \mathbf{A}^{\mathrm{T}} \mathbf{B}^{\mathrm{T}}$
- $(d) \quad (AB)^{T} = B^{T}A^{T}.$

P.T.O.

Maximum Marks : 80

(*ii*) A firm has the following total cost (TC) and demand functions :

$$TC = \frac{1}{3}Q^3 - 7Q^2 + 111Q + 50$$
$$Q = 100 - P.$$

- (a) Write out the total revenue (TR) function 'R' in terms of Q.
- (b) Formulate the total profit function (profit = π) in terms of Q.
- (c) Find the profit maximising level of output Q^* .
- (d) What is the maximum profit ?
- 2. Answer the following questions (any one) : [20]
 - (i) Given the following model :

 $Y = C + I_0 + G_0$ C = a + b(Y - T)T = d + t(Y).

Given :

(a > 0, 0 < b < 1)(d > 0, 0 < t < 1)T = taxes

t = income tax rate.

- (a) How many endogenous variable are there ?
- (b) Find equilibrium level of Y, T and C.

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- (*ii*) In a basic Keynesian macro economic model it is assumed that Y = C + I where I = 820 and C = 60 + 0.8Y, then answer the following :
 - (a) What is the marginal propensity to consume ?
 - (b) What is the equilibrium level of Y?
 - (c) What is the value of the multiplier ?
 - (d) What increase in I is required to increase Y to 5000?
 - (e) If this increase takes place, will savings (Y C) still equal to I.
- **3.** Answer the following questions (any two): [20]
 - (i) When will average variable cost be at its minimum value for the total cost function ?

$$TC = 40 + 82q - 6q^2 + 0.2q^3.$$

- (*ii*) Find $\frac{\partial y}{\partial x}$ and $\frac{\partial y}{\partial z}$ when : (*a*) $y = 6 + 3x + 16z + 4x^2 + 2z^2$ (*b*) $y = 14x^3z^2$ (*c*) $y = 9 + 4xz - 3x^{-2}z^3$.
- (*iii*) Solve the matrix algebra by putting them in appropriate matrix format :

5x	+	4y	+	9z	=	95			
2x	+	у	+	4z	=	32			
2x	+	5у	+	4z	=	61.			

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P.T.O.

- (*iv*) A firm faces the non-linear demand schedule $P = (650 0.25q)^{1.5}$. What output should it sell to maximise total revenue ?
- 4. Answer the following questions (any *four*) : [20]
 - (i) Given the demand function Q = 200 4P. Derive the inverse demand function.
 - (ii) Solve :

$$600 = 3x + 0.5y$$

$$52 = 1.5y - 0.2x.$$

(iii) Evaluate the following determinent :

$$\begin{bmatrix} 2 & 5 & 9 \\ 4 & 8 & 3 \\ 1 & 7 & 4 \end{bmatrix}.$$

(*iv*) Find the total variable cost function corresponding to the following marginal cost function :

 $MC = 185 - 24q + 1.2q^2.$

- (v) If Rs. 4,000 is invested at 5% compound rate of interest for3 years, what will be final sum be ?
- (vi) A firm's total costs are given by the expression :

0.2qa + 0.05qb + 0.1qc

where q is output and a, b and c are the per unit costs (in Rs.) of the three different inputs used. Evaluate these costs if q = 1000, a = 0.6, b = 1.3 and c = 2.1.

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