## Master of Arts Ist Semester (0307) Examination

# 2658

## ECONOMICS
### (Quantitative Methods-I)
### Paper : MAECO–103

Time : 3 Hours]

[Maximum Marks : 80

*Note* :– The *first* question is compulsory. Answer any *ten* short answer type questions. Each question is of 2 marks. Attempt *one* question each from the remaining four Units. Simple, non-scientific and non-programmable calculator is allowed.

1. Attempt any *ten* of the following questions (in **25–30** words) each :

(i)     Define Homogeneous function.

(ii)    State the criterion for determining the maximum and the minimum values of the function.

(iii) Find partial derivatives $\frac{\partial \mu}{\partial x}, \frac{\partial \mu}{\partial y}$ if

$\mu = (x + y)e^{x+y}$.

(iv) If the demand law is given by $q = \frac{20}{p+1}$, find

elasticity of demand if $p = 3$.

(v) Distinguish between simple growth rate and compound growth rate.

(vi) Define quadratic forms.

(vii) Define rank of a matrix.

(viii) Distinguish between linear independence and dependence of vectors.

(ix) Explain multiple regression.

(x) What do you know about adjusted $R^2$ ?

(xi) What is the need for analysis of time series ?

(xii) Define Random variable.

(xiii) Define moment generating function.

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(xiv) Explain additive law of probability.

(xv) What do you understand by splicing of Index Numbers ?

$10 \times 2 = 20$

## Unit–I

2. (a) Verify Fuler's theorem for the function

$$U = (x + y)(x^2 + y^2)^{1/3}.$$

(b) Find the extreme values of the function $U = 3x + 6y$ subject to the constraint $x^2 + 5y^2 = 25$.

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3. (a) If $q_r = 3p_r^{-3}p_i^4$, $q_i = 4p_r^{-2}p_i^3$ be the demand functions for two related goods. then find :

(i) partial elasticities and

(ii) are the goods competitive or complementary ?

(b) Give the total cost function

$$C = 10q - 4q^4 + 3q^5$$

Find the minimum average cost.

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Turn Over

## Unit-II

4. (a) A company wants to invest Rs. 5,000 in a machine that yields an income of Rs. 800 per year for the next 8 years. If the future income are discounted at a rate of 6% per annum, find whether the investment is profitable or not ?

(b) Show that the transpose of A is one-third of its adjoint, where A is a matrix given as

$$A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}.$$

5. (a) Solve the following system of equations using matrix inverse method :

$$2x_1 + 3x_2 + x_3 = 0$$

$$4x_1 - 8x_2 - 6x_3 = 2$$

$$6x_1 + x_2 - x_3 = 0$$

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(b) Show that the vectors $(1, 1, 1)$, $(1, 2, 3)$ and $(3, 3, 4)$ are linearly independent.

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## Unit–III

6. (a) Is it possible to get the following from a set of experimental data $r_{23} = 0.7$, $r_{13} = -0.4$, $r_{12} = 0.6$.

(b) For the following data, find the multiple regression equation of Y on $X_1$ and $X_2$. Also predict Y for $X_1 = 36$ and $X_2 = 16$.

| Y | 8 | 36 | 23 | 27 | 14 | 12 | |
|---|---|----|----|----|----|----|---|
| $X_1$ | 10 | 37 | 18 | 29 | 14 | 28 | |
| $X_2$ | 8 | 20 | 14 | 11 | 9 | 4 | 7,8 |

7. (a) Explain any one method of measuring reasonal indices of time series.

(b) From the given data :

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|------|------|------|------|------|------|------|------|
| Earnings (Rs. Lakhs) | 15 | 14 | 18 | 20 | 17 | 24 | 27 |

Calculate the quadratic trend by the method of least square and forecast the earnings for the year 2009.

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## Unit–IV

8. (a) Two groups each of three children contain respectively two boys and one girl and one boy and two girls. One child is drawn at random from each group. Calculate the probability that

(i) both will be boy

(ii) one boy and the other girl.

(b) A random variable 'X' is defined as the sum of faces when a pair of dice is thrown. Find the expected value of X.

8.

9. (a) Discuss the problems faced in the construction of an index number of prices.

(b) Calculate Fisher's Ideal Index from the following data and prove that it satisfies both the time reversal and factor reversal tests.

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| Commodity | 2002 | | 2003 | |
|---|---|---|---|---|
| | Price | Exp. | Price | Exp. |
| A | 8 | 80 | 10 | 120 |
| B | 10 | 120 | 12 | 96 |
| C | 5 | 40 | 5 | 50 |
| D | 4 | 56 | 3 | 60 |
| E | 20 | 100 | 25 | 150 |

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