

Exam. Code : 103203

Subject Code : 1124

B.A./B.Sc. 3rd Semester

QUANTITATIVE TECHNIQUES—III

Time Allowed—Three Hours] [Maximum Marks—100

Note :—(1) The **First** question consisting of **TEN** short answer type questions is compulsory. Attempt to answer **all** parts of this question in upto **5** lines. Each part carries **2** marks.

(2) The candidate will attempt **ONE** out of **TWO** questions from each of the **four** units (of **20** marks each).

1. (a) Differentiate $y = (x^2 - 4)^2$.
- (b) Show that $y = x^2 - 2x + 1$ has a minimum but no maximum.
- (c) Evaluate $\int \ln x dx$.
- (d) Is producers' surplus necessarily equal to profit? Explain.
- (e) If for two square matrices, it is the case that $AB = BA$, what can you say about A and B?
- (f) If the product of two square matrices is 0, what can we say about at least one of the matrices?

- (g) Show that the dual of a dual is the original primal problem itself.
- (h) Show with the help of an example that for matrices $A + 2(B - C) = A + 2B - 2C$.
- (i) A production function is given by $Q = L^2$ where L is labour used. What is the marginal product ?
- (j) What are the Hawkins Simon conditions ?

2×10=20

UNIT—I

2. (a) Consider the function $y = 12 - 16x + 2x^2$. For what value of x is it minimised ? Show that it does not have a maxima. 10
- (b) A consumer's utility function is given by $U = 12q - q^2/2$ where q is the quantity of chocolate consumed and utility is measured in rupees. If the price of chocolate is Rs. 4 per bar, how many bars of chocolate should he consume ? 10
3. (a) Consider the function $V = e^{xy+x} + 2xy^2$. What are the partial differentials of V wrt x and y ? 10
- (b) Let $Z = (x - y)^2/(2x^2 - y)$. Find the total differential of Z . 10

UNIT—II

4. (a) Evaluate $\int \{(x-1)/(x+1)\} dx$. 10
- (b) Evaluate the area between the curve $y = -x^2 + 8x$ and the X axis for which $y \geq 0$. 10

5. The demand and supply curve for an industry is $Q = 12 - p$ and $Q = 3p$ respectively. Calculate the consumer and producers' surplus at the equilibrium price. 20

UNIT—III

6. Consider the set of equations and use the matrix inverse method to solve for x , y and z :

$$5x + y + z = 17$$

$$x - 6y + 2z = -8$$

$$x + 2y - 7z = -20 \quad 20$$

7. In a macroeconomic model, the consumption function is represented by $C = 200 + 0.25Y$, the investment function by $I = 150 + 0.25Y - 1000i$, Government expenditure $G = 250$. The demand for money is represented by $M^D = 2Y - 8000i$, while money supply is exogenously given and is given by $M^S = 1600$. Calculate the equilibrium income Y and the rate of interest i . 20

UNIT—IV

8. (a) Solve the following LPP graphically : Minimise $Z = 10x + 6y$ subject to the constraints : $5x + y \geq 3$ and $x + y \geq 1$ provided x and $y \geq 0$. 5

- (b) An edible oil company owns two Plants. Plant A costs Rs. 10,000 per day to operate, and it can produce 400 kilolitres of highly refined oil, 300 kilolitres of medium refined oil, and 200 kilolitres of low-grade oil each day. Refinery B is newer and more modern. It costs Rs. 15,000 per day to operate, and it can produce 300 kilolitres of highly refined oil, 400 kilolitres of medium-refined oil, and 500 kilolitres of low-refined oil each day.

The company has orders totaling 15,000 kilolitres of highly refined oil, 16,000 kilolitres of medium refined oil, and 24,000 kilolitres of low refined oil. How many days should it run each refinery to minimize its costs and still refine enough oil to meet its orders ? 15

9. (a) Suppose there are three sectors in the economy which produce a final demand :

	Primary	Secondary	Tertiary	Final Demand
Primary	10	30	10	50
Secondary	30	50	20	100
Tertiary	10	20	20	50

Then to produce a final demand of 60, 120 and 80 what should be the gross output of the primary, secondary and tertiary sectors ? 16

- (b) For an input output model to be productive, what property(ies) should the technology matrix have ? 4