6. (a) Define homogeneous function and state its properties. Check whether the following functions are homogeneous or not :

(i) $f(x,y) = 4x^5y + 5x^4y^2 - 2x^3y^3$

(ii) $f(x,y) = x^{3/4}y^{1/4} + 2x$

(b) A production function is given by $q = 4L^{\frac{2}{3}}K^{\frac{1}{3}}$ where L is labour and K is capital,

(i) Check whether the given function is homogeneous,

(ii) Apply Euler's theorem if (i) satisfies.

7. (a) The production function is $X=Ka^{\alpha}b^{\beta}$, where $0 < \alpha$, $\beta < 1$. Show that total product is greater than 'a' times the marginal product of A plus 'b' times the marginal product of B.

(b) Explain the following :

(i) Returns to scale,

(ii) Isoquants,

(iii) Equilibrium of the firm.

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 6095 **H**

Unique Paper Code : 2374001202

Name of the Paper : Applications in Statistics

Name of the Course : **GE**

Semester : II (NEP)

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **six** questions in all. **Q1.** is compulsory
3. **All** questions carry equal marks.
4. Use of a non-programmable Scientific Calculator is allowed.

1. (a) Describe in brief the functions of the Central Statistical Organization and name its five publications.

(b) Write about National Statistical Commission in India, mentioning its two important functions.

2. (a) Describe Pareto's law of income distribution and state its applications.

(b) (i) Explain partial and cross elasticity of demand.

(ii) Following are the demand functions for the two commodities X_1 and X_2

$$x_1 = p_1^{-1.7}\, p_2^{0.8};\quad x_2 = p_1^{0.5}\, p_2^{-0.2}.$$

Determine whether the commodities are complementary or competitive.

3. (a) Discuss the methods of estimation of income elasticities of demand on the basis of family budget data. If the demand and supply curve for computers is :

$$D = 100 - 6P,\quad S = 28 + 3P$$

where, P is the price of computers, what is the quantity of computers bought and sold at equilibrium?

(b) The demand function for a commodity X is given by

$$x = 300 - 0.5p_x^2 + 0.02p_0 + 0.05y$$

where x is the quantity demanded of X, p_x is the price of X, p_0 is the price of a related commodity and y is the constants income. Compute

(i) the price elasticity of demand for X

(ii) the income elasticity of demand for X

(iii) cross elasticity of demand w.r.t. p0

4. (a) Define the indifference curve with its properties and marginal rate of substitution.

(b) Find the optimum level of commodities for a consumer whose utility function is $U = e^{x_1 x_2}$. It is given that prices of x_1 and x_2 are 10 and 50 respectively, with an income 100. Also, comment on the optimum level of commodities, when $U = x_1 x_2$.

5. (a) Define the budget line (or constraint). What are the necessary and sufficient conditions for maximizing the utility function w.r.t a given budget line?

(b) If $U = x^{\alpha} y^{\beta}$ is an individual's utility function for two goods, show that his demands for the goods are

$$x = \frac{\alpha M}{\left[(\alpha+\beta)p_x\right]} \text{ and } y = \frac{\beta M}{\left[(\alpha+\beta)p_y\right]}$$

where p_x and p_y are fixed prices and M is the individual fixed income. Deduce the elasticity of demand for either good w.r.t income and its price.