

B.A. (Honours) Examination, 2023

Semester-III

Economics

Course: CC-5

(Intermediate Microeconomics I)

Time: 3 Hours

Full marks: 60

Questions are of value as indicated in the margin.

Answer **Question no 1** and **any three** from the rest of the following questions

1. a. Assume that there are two sources of pollution into a lake. The local water authority can clean up the discharges and reduce pollution levels from these sources but there are, of course, costs involved. The damage effects of each pollution source are measured on a 'pollution scale'. To achieve the lower the pollution level, higher cost need to be incurred, as is shown by the cost schedules for cleaning up the two pollution sources:

$$Z_1 = 478 - 2C_1^{0.5}$$

and

$$Z_2 = 600 - 3C_2^{0.5}$$

where Z_1 and Z_2 are pollution levels and C_1 and C_2 are expenditure levels (in Rs) on reducing pollution.

To secure an acceptable level of water purity in the lake, the water authority's objective is to reduce the total pollution level to 1,000 by the cheapest method. How can it do this?

- b. "An inflection point must be a stationary point."- True or False? Explain your answer.

10+5

2. a. A quadratic profit function $\pi(Q) = hQ^2 + jQ + k$ is to be used to reflect the following assumptions:

(i) If nothing is produced, the profit will be negative (because of fixed costs).

(ii) The profit function is strictly concave.

(iii) The maximum profit occurs at a positive output level Q^* .

What parameter restrictions needed for the above?

b. Given the function

$$y = a - \frac{b}{c+x} \quad (a, b, c > 0; x \geq 0)$$

determine the general shape of its graph by examining (i) its first and second derivatives, (ii) its vertical intercept, and (iii) the limit of y as x tends to infinity. If this function is to be used as a consumption function, how should the parameters be restricted in order to make it economically sensible?

(1+2+3)+(3+2+2+2)

3. a. Proof that for the CES production function, the sum of output elasticities is one.

b. Show that for Cobb-Douglas production function, the expansion path is a straight line through the origin.

c. A consumer's demand curve for a good is given by $P = 100 - \sqrt{x}$. Calculate the price elasticity of demand when the price of the good is 40.

5+4+6

4. a. Explain Walrasian and Marshallian stability conditions with the help of demand-supply curves.

b. Give an example of equilibrium which is stable according to Marshallian condition but unstable with Walrasian condition.

c. State whether the following function is (strictly) quasiconcave or (strictly) quasiconvex. Then comment whether the function is concave, convex or neither.

$$Z = -(x + 1)^2 - (y + 1)^2$$

4+4+(4+3)

5. a. A consumer has the utility function $U = X^2Y^2$, and the budget constraint $M = P_X X + P_Y Y$.

(i) Set up the constrained maximization problem and derive the first-order conditions.

(ii) Derive the consumer's demand for X and Y in terms of the parameters.

- b. Proof that facing the same budget line the original utility function $U = f(x, y)$ and its monotonic transformation $V = g(f(x, y))$ will have same equilibrium value of x and y .

(3+7)+5

6. a. Show that diminishing marginal utility is neither necessary nor sufficient condition for regular strictly quasi-concavity of the utility function or convexity of indifference curve.
- b. Derive and interpret the Slutsky equation for a consumer with utility function $U = xy$.

7+8

7. a. State and explain the Weak Axiom of Revealed Preference.
- b. Consider the following dataset of consumer in a world with only two goods. when prices $p_1 = 1, p_2 = 2$ and $p_3 = 1$ the chosen bundle (x_1, x_2, x_3) was $(1, 0, 0)$; when $(p_1, p_2, p_3) = (1, 1, 2), (x_1, x_2, x_3) = (0, 1, 0)$; when $(p_1, p_2, p_3) = (2, 1, 1), (x_1, x_2, x_3) = (0, 0, 1)$. Check whether the above date set satisfies the Weak Axiom of Revealed Preference.

4+11