2021

ECONOMICS — HONOURS

Paper : CC-4

Full Marks : 65

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group-A

1. Answer ***any ten*** questions:

(a) If $y = ax^b$, find the elasticity of y w.r.t. x. 2

(b) What do you mean by comparative statics in economics? 2

(c) Let a person's preference for biscuits (x) and tea (y) could be represented by the utility function $u = xy$. When he is consuming 10 units of biscuits and 20 units of tea, how much tea will he be ready to sacrifice to get one additional unit of biscuit? 2

(d) Show that the expenditure function $E = 2p_x^{0\cdot5}p_y^{0\cdot5}u$ is homogeneous in prices. 2

(e) The expenditure function is given by– $E(P_x, P_y, M) = 2\sqrt{u^* P_x P_y} - 2P_x - P_y$; where P_x and P_y are the prices of the two commodities and u^* is the target level of utility. Find the compensated demand functions for the two commodities. 1+1

(f) Examine whether the function $f(x, y) = xy$ is quasiconcave or quasiconvex. 2

(g) Show that the quadratic equation formed by the following matrix product is negative definite.

$$[x \quad y]\begin{bmatrix} -2 & 3 \\ 1 & -4 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}$$ 2

(h) State the Shephard's Lemma. 2

(i) What does the Euler's theorem state? 2

(j) Examine whether the following paths are oscillatory/non-oscillatory and convergent/divergent—

(i) $y_t = -3\left(\frac{1}{4}\right)^t + 2$

(ii) $y_t = 3^t + 1$ 1+1

(k) Find the value of a function $f(x) = x^3 - 6x^2 + 12$ at the point of inflexion. 2

(l) What is a convex set? 2

(m) State whether the following statements are true or false and correct the false statement(s)–

(i) A concave function is also quasiconcave.

(ii) A linear function is neither quasiconcave, nor quasiconvex. 1+1

(n) What do you mean by dynamically stable equilibrium? 2

(o) A farmer had a certain length of fence P and wished to enclose the largest possible rectangular area. Form the Lagrange function for this constrained optimisation problem. 2

Group-B

Answer ***any three*** questions.

2. Given a continuous income stream at the constant rate of Rs. 1,000 per year, what will be the present value of return if the income stream lasts for 2 years and the discount rate is 0·05 per year. 5

3. The consumption function is given by $C = 4141 + 0 \cdot 78Y$; National Income $Y = C + I$. Find the value of the investment multiplier and interpret the result. 4+1

4. An economy produces two goods *x* and *y* using labour as the only input. The Production Possibility Frontier for the two goods is given by $x^2 + 0 \cdot 25y^2 = 200$. The production function for goods $x: x = L_x^{0 \cdot 5}$ and the production function for goods $y: y = 2L_y^{0 \cdot 5}$ (where L_x and L_y are the quantities of labour used in *x* and *y* production respectively). Total amount of labour available is 200 units. If labour is equally allocated between *x* and *y*, determine the quantities of *x* and *y* produced. Also determine the trade-off between *x* and *y* as exhibited by the Production Possibility Frontier. 2+3

5. From the differential equation $\frac{dy}{dt} + ay = b$, determine the time path of y where a and b are non-zero constants. 5

6. Consider the following function:

$$y = 4x_1^2 - x_1x_2 + x_2^2 - x_1^3$$

Determine whether the stationary point is a maximum, minimum or saddle point. 5

Group-C

Answer ***any three*** questions.

7. (a) Consider the following model—

$$C = C(y, r), I = I(y, r)$$

$$y = C + I + G$$

$$M^D = L(y, r)\ M^S = \overline{M}$$

$$M^D = M^S$$

Find the effect of change in G and M^S on y and r. Assume $C_y + I_y < 1$. [Symbols have their usual meaning]

(b) The demand and supply equations are given by—

$D = a - b(P + t)$

$S = \alpha + \beta P$

Where P is the price, t is the tax rate and a, b, α, β are positive constants.

Compute $\frac{dP}{dt}$ by implicit differentiation and interpret the result. 6+(3+1)

8. (a) Examine whether the following functions are homothetic—

(i) $f(x, y) = xy + 1$

(ii) $f(x, y) = 3 \log x + 4 \log y$

(b) Consider the following production function for transportation in a particular city–

$Q = \alpha L^{\beta_1} F^{\beta_2} K^{\beta_3}$; F=fuel in gallon; K=capital in number of buses; L=labour input in worker hour and Q=output in millions of bus miles.

Given that $\alpha = 0{\cdot}0012$, $\beta_1 = 0{\cdot}45$, $\beta_2 = 0{\cdot}20$ and $\beta_3 = 0{\cdot}30$,

(i) Determine output elasticities for labour and capital.

(ii) If labour increases by 10%, by what percentage will output increase?

(iii) If every year 3% of the buses are taken off what effect will it have on output? (2½+2½)+(1+1+1½+1½)

9. (a) Construct an indirect utility function for the direct function $u = \log x_1 + \log x_2$. Verify the Roy's Identity.

(b) State the significance of Lagrange Multiplier. (5+2)+3

10. (a) Consider the following linear programming problem—

Maximise profit $\pi = 2x_1 + 5x_2$ subject to $x_1 + 4x_2 \leq 24, 3x_1 + x_2 \leq 21, x_1 + x_2 \leq 9, x_1 \geq 0, x_2 \geq 0$.

It is given that optimal solution to the above problem is $x_1^* = 4, x_2^* = 5$.

Solve the dual problem using the above information.

(b) Solve the following linear programming problem graphically—

$\pi = 40x_1 + 30x_2$

subject to $x_1 \leq 16$

$x_2 \leq 8$

$x_1 + 2x_2 \leq 24$

$x_1, x_2 \geq 0$ 5+5

Please Turn Over

11. A consumer has the utility function $U(x, y) = x(y + 1)$ where x and y are quantities of two consumption goods whose prices are P_x and P_y respectively. The consumer has a money income of M.

(i) Find the Marshallian demand functions for the two goods.

(ii) Determine the own price elasticity, cross price elasticity and income elasticity of demand for goods x. 4+6