

M.A. Examination, 2018
Semester-I
Economics
Course – C4 (Core)
(Quantitative Economic Analysis)

Time: Three Hours

Full Marks: 40

Questions are of value as indicated in the margin

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

1. Find the optimal control path for the following problems that will
 - (a) Maximize $\int_0^1 (y - u^2) dt$
Subject to $\dot{y} = u$ and $y(0) = 2, y(1)$ free.
 - (b) Maximize $\int_0^T -(t^2 + u^2) dt$
Subject to $\dot{y} = u, y(0) = 4, y(T) = 5$ and T free. 4+6
2. (a) Find the optimal control path that will
Maximize $\int_0^1 (y - u^2) dt$
Subject to $\dot{y} = u$ and $y(0) = 5, y(1)$ free.
 - (b) Derive using optimal control theory the shortest path between two points. 5+5
3. Use the following information about a Leontief static open input-output model to answer the questions given below.
 $x_{11}=50; x_{12}=30; x_{21}=40$ and $x_{22}=30$; where x_{ij} is amount of sector i 's output required as input to produce x_j . Final consumption demands of sector 1 and 2 are respectively 20 and 30.
 - (a) Determine the input-output matrix.
 - (b) Check Hawkins-Simon condition.
 - (c) Find the technology matrix.
 - (d) Final equilibrium to meet final consumption demand $C_1=100; C_2=200$. 3+3+1+3
4. (a) Show that if any of the primal problems be unrestricted in sign, then the corresponding constraint of the dual will be equality.
 - (b) State and prove the strong duality theorem. 6+4

P.T.O.

(2)

5. (a) A manufacture of patent medicines is preparing a production plan on medicines A and B. There are sufficient ingredients available to make 20000 bottles of A and 40000 bottles of B, but there are only 45000 bottles into which either of the medicines can be put. Furthermore it takes three hours to prepare enough material to fill 1000 bottles of A, it takes one hour to prepare enough material to fill 1000 bottles of B and there are 66 hours available for this operation. The profit is Rs. 8.00 per bottle of A and Rs. 7.00 per bottle of B.

Formulate this as a linear programming problem to maximize the profit.

- (b) Find the dual of the following LPP

$$\text{Maximize } z = x_1 - x_2 + 3x_3 + 2x_4$$

$$\text{Subject to } x_1 + x_2 \geq -1,$$

$$x_1 - 3x_2 - x_3 \leq 7,$$

$$x_1 + x_2 - 3x_4 = -2,$$

$$x_1, x_4 \geq 0 \text{ and } x_2, x_3 \text{ are unrestricted in sign.}$$

4+6

6. Show that the long-run equilibrium is a saddle point in the Ramsey-Solow Model. 10
7. (a) Derive Hawkins-Simon condition graphically.
- (b) Explain the economic interpretation of Hawkins-Simon condition. 5+5
