2014

M.A. / M.Sc.

1st Semester Examination

PAPER—ECO-104

Full Marks : 40

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

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

Illustrate the answers wherever necessary.

Group—A

1. Answer any *two* questions of the following :   2×2

   (a) Is linear programming technique an improvement over classical technique of optimisation ? Explain very briefly.

   (b) What is complementary slackness in non-linear programming problem ?

   (c) What are maximum and minimum value functions ?

   (d) Define injective and subjective functions.

2. Answer any *one* question of the following : 1×6

  (a) Illustrate with the help of an example, non-linearity in economics.

  (b) Find the solution set of the inequality :

$$\left|\frac{x+3}{2x-6}\right| \le 1.$$

3. Answer any *one* question of the following : 1×10

  (a) For a non-linear programming problem with linear constraints, show that the constraint qualification will invariably be met and the Kuhn-Tucker conditions will always hold at an optimal solution.

  (b) Check whether the Kuhn-Tucker conditions are satisfied by the following problem :

  Minimize $C = (x_1 - 4)^2 + (x_2 - 4)^2$

  Subject to $\quad 2x_1 + 3x_2 \ge 6$

  $\qquad\qquad -3x_1 - 2x_2 \ge -12$

  and $\qquad x_1, x_2 \ge 0.$

Group—B

4. Answer any *two* questions of the following : 2×2

  (a) Define pure-strategy Nash equilibrium for a Normal-form finite game.

  (b) What do you mean by extensive-form representation of a game.

(c) Distinguish between static and dynamic optimisation.

(d) Write a macroeconomic problem of optimal control.

5. Answer any *one* question of the following :   6×1

(a) Show, with suitable examples, the limitations of the arguments of backward induction for a reasonable play.

(b) What are the different types of steady states in systems of two linear differential equations ? With a suitable example draw a phase diagram to show the unstable node.

6. Answer any *one* question :   1×10

(a) Define subgame and SPNE.

Represent the following extensive form game in Normal-form first. Then find out the Nash equilibria of the formal form game. Also find out the SPNE of the game and comment.

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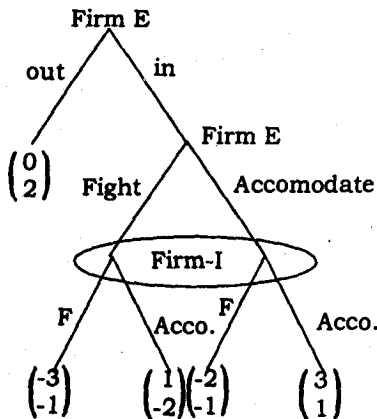
(b) (i) Solve the following problem using optimal control theory :

$$\max \int_0^1 \left(x - u^2\right) dt$$

s.t. $\dot{x} = u$

$x(0) = 10$

(ii) Write the necessary conditions for optimisation when there is discounting. How can you solve the following maximisation problem using current valued Hamiltonian :

$$\int_0^T e^{\rho t}\left[ax - bx^2 - cy^2\right] dt$$

s.t. $\dot{x} = y - dx$

$x(0) = x_0$.

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