B.A. (Honours) Examination, 2014

Semester – V

Economics

Paper – H-12

(Mathematical Economics-II)

Time: 3 Hours **Full Marks: 40**

Questions are of value as indicated in the margin.

Answer ***any four*** questions.

1. Consider a commodity where both the demand and supply quantities are functions of its current price:

$$Q_{dt} = \alpha - \beta P_t \qquad (\alpha,\beta>0)$$
$$Q_{st} = -\gamma + \delta P_t \qquad (\gamma,\delta>0)$$

However, the price adjustment is made by suppliers and in each period the price is set at a discount over the previous period's price depending on the stock (inventory) of the commodity accumulated from the previous period. The price setting mechanism is given by the following equation:

$$P_{t+1} = P_t - \sigma(Q_{st} - Q_{dt}) \qquad (\sigma > 0)$$

(i) Find out the time path of price and the equilibrium price.

(ii) Find the nature of time path of price if $0 < \sigma < 1/(\beta+\delta)$ and show the time path graphically (assume initial price to be above the equilibrium price) 6+4=10

2. Consider the following demand and supply functions of a commodity:

$$Q_d = 10 - 2P + 3P' - P''$$
$$Q_s = -5 + 3P - 7P' + 4P''$$

It is also given that P (0) = 5 and P′(0)=3.

(a) Find the time path P (t).

(b) What is the intertemporal equilibrium price?

(c) Discuss the nature of the time path of price and show it graphically. 5+1+4=10

3. Set up the Samuelson model of multiplier accelerator interaction. Show that, following divergence from equilibrium value, output of this model will move monotonically towards equilibrium value if $v < \left(1-\sqrt{s}\right)^2$ and will move monotonically away from equilibrium if $v > \left(1+\sqrt{s}\right)^2$ [where v is the acceleration coefficient and s is marginal propensity to save]. When will output oscillate in this model? 10

P.T.O.

4. Consider the following information:

   A carpenter uses wood and labour to produce tables and chairs. He has a total availability of 300 cubic feet of wood and 110 labour hours. A table requires 30 cubic feet of wood and 5 labour hours as inputs. For a chair, the input requirements are 20 cubic feet of wood and 10 labour hours. A table and a chair give 6 units and 8 units of profit respectively.

   (a) Use the above information to formulate an LPP for the carpenter.

   (b) Solve the LPP by graphical method.

   (c) Construct the dual of the LPP.

   (d) Interpret the dual variables in this context. 2+4+2+2=10

5. Consider the following LPP:

   Maximize $Z = c_1x_1 + c_2x_2$

   subject to $a_{11}x_1 + a_{12}x_2 \leq b_1$
   $a_{21}x_1 + a_{22}x_2 \leq b_2$
   $a_{31}x_1 + a_{32}x_2 \leq b_3$
   $x_1, x_2, x_3 \geq 0$

   (i) Construct the dual problem.

   (ii) Show that the optimal value of the objective function of this problem cannot be more than that of its dual problem. 2+8=10

6. State and prove the theorem of complementary slackness in the context of LPP. 10

7. (a) Formulate a two-sector open Input-Output model after clearly describing the underlying assumptions.

   (b) Derive the Hawkins-Simon condition for a feasible output vector following your model. 5+5=10

8. For a two-sector static open input-output model, find out the consumption possibility frontier. 10
