

M.A. Examination, 2016
Semester-III
Economics
Course-X (Core)
(Quantitative Methods)

Time: 3 Hours

Full Marks: 40

Questions are of value as indicated in the margin.

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

1. Consider a version of Solow model with the standard assumptions: constant population growth rate, $\frac{\dot{L}(t)}{L(t)} = n > 0$; and the constant saving rate, $s(t) = sY(t)$, $s \in (0,1)$. The only difference with the standard Solow model is that the production function, $Y(t) = F(K(t), L(t))$, satisfies the property of diminishing returns to scale.

(a) Write down the time path of labour, $L(t)$.

(b) Derive the intensive form of production function, $y(t) = f(k(t))$, where $y(t) = \frac{Y(t)}{L(t)}$, and $k(t) = \frac{K(t)}{L(t)}$.

(c) Using the time path of, $L(t)$, and the intensive form production function, $y(t) = f(k(t))$, derive the expression for the capital accumulation equation, $\frac{\dot{k}(t)}{k(t)}$.

(d) Explain the possibility of the existence of a steady-state equilibrium for this formulation of the Solow model. 1+2+3+4

2. Draw the phase diagram and analyse the nature of stability of steady state growth equilibrium in the following two sector dynamic model, given by

$$\dot{k}_1 = 12 - k_1 - k_2 ; \text{ and}$$

$$\dot{k}_2 = \sqrt{k_1} - k_2$$

Here \dot{k}_i is the capital labour ratio in the i th sector. 10

3. Show that the long-run equilibrium is a saddle point in the Ramsey-Solow model. 10

(2)

4. a. Find the steady-state points and determine their stability properties for the following

$$\dot{y} = 3y^2 - 2y.$$

- b. Quantity demanded in a market is given by

$$q^d = P^{-2}$$

and quantity supplied is given by

$$q^s = 8P$$

If price adjusts according to $\dot{P} = \alpha(q^d - q^s)$, where $\alpha > 0$ is a constant, conduct a qualitative analysis of the dynamics of market price. 5+5

5. a. Solve the following differential equation

$$(t + 2y)dy + (y + 3t^2)dt = 0.$$

- b. Write a short note on "Bernoulli's Equation". 6+4

6. Show in the context of Barrow (1990) model that competitive market equilibrium is Pareto inefficient. 10

7. Two cars are meeting at an intersection and want to proceed as indicated by the arrows in following figure. Each player can proceed or move. If both proceed, there is an accident. A would have a payoff of -100 in this case, and B a payoff of -1000 (since B would be made responsible for the accident, since A has the right of way). If one yields and the other proceeds, the one yielding has a payoff of -5, and the other one of 5. If both yield, it takes a little longer until they can proceed, so both have a payoff of -10. Analyze this simultaneous game, draw the payoff matrix, and find pure Nash equilibrium(s).

