2012
[December]
ECONOMICS
Mathematics for Economists

Full Marks: 75; Time: 3 hours
The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting at least **one** from each Credit
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CREDIT – I

1. (a) Given the subsets $A = \{4,5,6\}, B = \{3,4,6,7\}, \& C = \{2,3,6\}$ of a universal set verify the following:
    (i) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$
    (ii) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

    5

    (b) Solve the following national income model by Cramer's rule:
    $$Y = C + I_0 + G_0 + X_0 - M$$
    $$C = \alpha + \beta(Y - T) \qquad (\alpha > 0 \ \& \ 0 < \beta < 1)$$
    $$M = \gamma + \delta Y \qquad (\gamma > 0 \ \& \ 0 < \delta < 1)$$
    $$T = tY \qquad (0 < t < 1)$$

    Where $Y, C, I_0, G_0, X_0, M \& T$ are the national income, consumption, investment, government expenditure, export, import and taxes respectively.

    10

2. (a) Define function. How does it differ from relation? What are the various types of functions used by economists to understand and explain economic phenomena?

    3+3+2

    (b) Solve the following system of simultaneous equations by matrix inversion method:
    $$2P_1 + 3P_2 - P_3 = 15$$
    $$4P_2 + 2P_3 = 16$$
    $$3P_1 + 2P_2 = 18$$

    7

CREDIT – II

3. (a) Convert the following linear programming problem into its standard form:
    $$Minimize \ Z = X_1 - 2X_2 + 3X_3$$
    $$Subject \ to: X_1 + X_2 + X_3 \leq 7$$

    5

    $$X_1 - X_2 + X_3 \geq 2$$
    $$3X_1 - X_2 - 2X_3 = -5 \ where \ X_1, X_2 \geq 0 \ \& \ X_3 \ is \ unrestricted \ in \ sign.$$

    (b) *Given $P_X = 4, P_Y = 6, B = 130, Maximize \ U = (X + 2)(Y + 1) where \ P_X \& P_Y$ are* prices of commodities X & Y and U & B are utility and budgetary provision respectively.

10

4. Write short notes on the following:

   (a) Transportation problem
   (b) Least-cost input combination
   (c) Homogeneous production function

5X3=15

CREDIT – III

5. (a) Write an explanatory note on dynamic market model.

10

   (b) Solve $\dfrac{dy}{dt} + 2y = 6, \, given \, y(0) = 10$ without using formula.

5

6. Make a critical assessment of growth model propounded by Solow.

15

CREDIT – IV

7. (a) Derive the time path of y, given the second order differential equation having constant coefficients and constant term: $y''(t) + a_1 y'(t) + a_2 y(t) = b$.

10

   (b) Without making use of the formula solve the following first order difference equation: $Y_t - 2Y_{t-1} = 3, \, given \, y_0 = 2$.

5

8. (a) Write an explanatory note on market model with inventory.

8

   (b) Given the following demand and supply functions, find inter temporal equilibrium price and determine whether the equilibrium is stable:

$$Q_{dt} = 22 - 3P_t$$
$$Q_{st} = -2 + P_{t-1}$$

5+2