BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF COMMERCE

DEPARTMENT OF ECONOMICS

BACHELOR OF SCIENCE HONOURS DEGREE IN ECONOMICS

MATHEMATICS FOR ECONOMISTS II EC109

DURATION: 3 HOURS TOTAL MARKS: 100

INSTRUCTIONS

1. This paper carries four questions
2. Answer ALL questions.
3. All questions carry 25 marks.
4. Cellphones are not allowed in the examination room.

QUESTION 1

a. Suppose that a firm's production function is given by $Q = KL + 4K$. If the cost of capital is \$5 and the cost of labour is \$3, what is the least cost way for the firm to produce 60 units of output? **[10 Marks]**

b. Provide an economic interpretation of the Lagrangean multiplier in (a) above. **[2 marks]**

c. Suppose a firm faces the following total revenue and total cost functions:

$R(Q) = 2000Q - 6Q^2$

$C(Q) = Q^3 - 40Q^2 + 1200Q + 1400$

Find the maximum profit that can be attained. **[8 Marks]**

d. Find and classify the critical values of $f(x) = 7x^3 - 3x^2 + 4x - 5$ **[5 Marks]**

QUESTION 2

a. Find the total cost function from the marginal cost $C^I(Q) = 7 + 3e^{Q/3}$ function where Q is output. **[5 Marks]**

b. Solve the following integral functions:

i. $\int (x^7 - 12x)dx$ **[3 marks]**

ii. $\int 7e^x dx$ **[3 marks]**

iii. $\int \frac{2x}{x^2+3} dx$ [4 marks]

iv. $\int (8x+10)\sqrt{(4x^2+10x+1)}dx$ [5 marks]

c. If the marginal propensity to save function is $S'(Y) = 0.3 - 0.1Y^{-1/2}$ and aggregate saving is nil when income Y=81, find the savings function S(Y). [5 marks]

QUESTION 3

Solve the following differential equations:

a. $\frac{dy}{dt} - 3y = 0$; $y(0) = 6$ [3 Marks]

b. $2\frac{dy}{dt} + 4y = 7$; $y(0) = 0$ [4 Marks]

c. $y'' + x = e^x$ [4 Marks]

d. $(x + 4)\frac{dy}{dx} = x + 7$ [5 Marks]

e. $y'' + 2y' - 6y = 9$; $y(0) = 3$ *and* $y'(0) = 6$ [9 Marks]

QUESTION 4

Solve the following difference equations:

i. $y_{t+1} - \frac{1}{4}y_t = 8,\ y_0 = 6$ [4 marks]

ii. $y_{t+2} + 3y_{t+1} - 3y_t = 4;\ y_0 = 3\ and\ y_1 = 9$ [7 marks]

iii. $y_{t+2} + y_{t+1} + 5y_t = 6;\ y_0 = 2\ and\ y_1 = 5$ [7 marks]

iv. $y_{t+2} - 4y_{t+1} + 6y_t = 7;\ y_0 = 1\ and\ y_1 = 3$ [7 marks]

END OF PAPER