UNIVERSITY OF GHANA

COLLEGE OF HUMANITIES

B. A. FIRST SEMESTER EXAMINATIONS: 2023/2024

ECON441: ECONOMIC THEORY I (Micro) (3 Credits)

INSTRUCTIONS: *ANSWER ALL QUESTIONS. (Partial credit will be awarded on the basis of (partially correct) work shown. Write legibly and show your work).*

TIME ALLOWED: ***TWO AND A HALF (2½) HOURS***

Question 1 [30 marks]

Afia spends her fixed daily income on malt drink (Q_1) which cost GH¢4 per bottle and biscuit (Q_2) which costs GH¢2 per pack. Her Indirect utility function is given as $V = \frac{m}{p_1^2 p_2^3}$

Where p_1 = price of a bottle of malt drink; p_2 = price of a pack of biscuit; m = Afia's daily income.

(a) Derive Afia's ordinary demand functions for malt drink (q_1^*) and biscuit (q_2^*). ***(7 marks)***

(b) Based on the Slutsky equation of malt drink $\frac{\partial q_1}{\partial p_1} = \frac{\partial h_1}{\partial p_1} - q_1 \frac{\partial q_1}{\partial m}$, which decomposes own total effect into own substitution (SE) and own income (I.E) effects, determine and interpret the

(ii) own total effect (TE) of malt dink from the ordinary demand function. ***(4 marks)***

(iii) income effect (IE) of malt drink from the ordinary demand functions. ***(5 marks)***

(c) What are the values of the own-price total effect (TE) and Income effect (IE) of malt drink if Afia's daily income is GH¢160 ***(2 marks)***

(d) Derive Afia's expenditure function. ***(4 marks)***

(e) If the price of malt drink rises by 25%, given her daily income of 160, compute the amount of money that should be given to Afia to ensure that her welfare is not affected by the increase in the price of malt drink (Hint: compensating variation). ***(8 marks)***

Question 2 [25 marks]

(a) Consider a short-run production function of a firm as $q = x_1 x_2 - x_1 - x_2^2$ where x_1 is fixed input; x_2 is variable input:

(i) Determine the Marginal Product (MP_2) and the Average Product (AP_2) of the variable input. ***(2 marks)***

(ii) Determine an expression of x_2 in terms of x_1 within which the firm would operate as a profit maximizing entity. ***(6 marks)***

(iii) From (ii), if x_1 is fixed at 16, find the range of values of x_2 within which the firm maximizes profit and provide a diagrammatic sketch of your answer. ***(4 marks)***

(b) Given a firm's cost function as $c = \sqrt{q(r_1^2 + r_2^2)} + k$ where r_1 = price of input 1, r_2 = price of input 2, q = output and k is fixed cost, derive the input demand function of input 2.

(5 marks)

(c) Consider the long run unconstrained profit maximizing input demand functions of a firm as

$x_1 = \frac{r_1}{2p}$ and $x_2 = \frac{r_2}{p}$ where x_1 = input 1; x_2 = input 2; r_1 = price of input 1; r_2 = price of input 2; and p = output price.

(i) Derive the supply function of the firm if the long run production function is given as $q = x_1^2 + 0.5x_2^2$. *(4 marks)*

(ii) Determine the output price effect of the firm and explain your answer. *(4 marks)*

Question 3 [30 marks]

In a pure exchange competitive economy made up of two consumers, Asamoah (A) and Baah (B), with two commodities namely cocoa (Q_1), measured in tones and oil (Q_2) measured in barrels. Asamoah has initial endowment of cocoa and oils as $\bar{q}_{1A}$ and $\bar{q}_{2A}$ respectively and Baah also has initial endowment of cocoa and oil as $\bar{q}_{1B}$ and $\bar{q}_{2B}$ respectively. The utility functions of the two consumers are as follows:

$U^A = q_{1A}^2 q_{2A}$ *for Asamoah.*

$U^B = q_{1B} q_{2B}^2$ *for Baah.*

Given the price of a tone of cocoa as p_1 and price of a barrel of oil as p_2 and that each consumer maximizes his utility subject to his budget constraint.

(a) Write the budget constraint of each consumer. *(2 marks)*

(b) Determine the demand functions of cocoa and oil for each consumer in terms of prices and endowment. *(12 marks)*

(c) If Asamoah has initial endowment of 12 tones of cocoa and 6 barrels of oil and Baah has initial endowment of 9 tones of cocoa and 3 barrels of oil, derive the demand functions of cocoa and oil in terms of prices for each consumer. *(4 marks)*

(d) Find the relative prices of cocoa and oil if the two markets are in equilibrium. *(6 marks)*

(e) Indicate the excess supply or demand for each commodity by each consumer at the market equilibrium price and explain your answer. *(6 marks)*

Question 4 [15 marks]

(a) Consider a long run cost function of a perfect competitive firm as $C = q^3 - 4q^2 + 10q$, derive the long run supply function of this perfect competitive firm and explain your answer.

(8 marks)

(b) Given the profit function of a monopolist as $\Pi = R(q) - C(q)$, determine the effect of an imposition of a marginal profit tax, α (where $0 < \alpha < 1$) on the firm's equilibrium output. Explain your answer. *(7 marks)*