MID TERM EXAM
ODD SEMESTER 2017/2018
MATHEMATIC FOR ECONOMIC AND BUSINESS
WEDNESDAY, 18 October 2017

Rules:

- Closed Book&Note
- *Calculator* is allowed.
- *Handphone*/*Tablet* are not allowed.
- Exam time: 3 hours.
- Answer all the problems below

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SOAL 1 (25%)

The demand function of good 1 (Q_1) is known as below:

$Q_1 = 110 - 2P_1 - 4P_2 + 3P_3 + 0{,}2Y$

Determine:

a. The cross elasticity of demand of good 1 and good 2, and also between good 1 and good 3, if the price of each good and the level of income is: $P_1 = 4$, $P_2 = 2$, $P_3 = 3$, and $Y = 10.000$. **(5 points)**

   Note: If there are two goods, x1 and x2; the cross elasticity is the responsiveness of demand for good x1 following a change in the price of a related good x2, and vice versa

b. Explain the relations between good 1 and good 2, and also the relation between good 1 and good 3. **(5 points)**.

c. Calculate the income elasticity of good 1 if the known level of price (P_1, P_2, P_3) and income (Y) is the same as in point a. **(5 points)**

   Note: measures the responsiveness of the quantity demanded for a good or service to a change in the income of the people demanding the good, ceteris paribus..

d. If the price of good 2 increases 20%, how does it affect the demand of Q1? **(5 points)**

e. If the price of good 3 decreases by 10%, how does it affect the demand of Q1? **(5 points)**

SOAL 2 (25%)

The national income model of an open economy is given as following:

$$Y = C + I_0 + G_0 + (X_0 - M) \qquad \dots\dots\dots (1)$$
$$C = a + b(Y - T_0); \ (a > 0, 0 < b < 1) \qquad \dots\dots\dots (2)$$
$$M = mY; (0 < m < 1) \qquad \dots\dots\dots (3)$$

[Y: national income, C: household consumption, I_0: investment, G_0: government expenditure, X_0: export, M: import, T_0: *lump-sum* tax, while $a, b,$ and m are parameters]

a. Convert the system of equation above into matrix, where Y^*, C^*, and M^* are endogenous variable **(5 points)**.
b. Using Cramer's method, determine Y^*, C^*, and M^* in its *reduced-form* (or write it as functions of its parameters and exogenous variable) **(5 points)**
c. Based on the restriction of parameters stated in equation (2) and (3), evaluate the *non-singularity condition* of the coefficient matrices. What does the result imply? **(5 points)**
d. Based on the calculation resulted in (b), determine the national income, investment and import in equilibrium, if:
$I_0 = 300; G_0 = 100; X_0 = 200; T_0 = 200; a = 120; b = 0,6; m = 0.1$.
(5 points)
e. If the national income equilibrium (Y^*) obtained in (d) is substitute into equation (2) and equation (3), what did you get? Did you get the same result for C^* and M^* obtained in (d)? Show your calculation **(5 points)**

SOAL 3 (25%)

a. **(5 points)**

According to the theory, *average revenue/AR* is a function of output, Q. Or can be written as AR = f(Q). In the perfect competitive market, average revenue is equal to the market price, thus can be stated as below:

$$AR = P \; (AR \equiv \frac{TR}{Q} \equiv \frac{PQ}{Q} \equiv P)$$

If the average revenue is a function of ouput, price is also a function of output, and can also be stated as P = f(Q). Thus, we can conclude that the average revenue curve function is the is the inverse of demand curve function.

If the average rate curve function is known to be AR = 20 – Q, *marginal revenue*/MR function?

b. **(10 points)**

Referring to the national income model in **problem 2** (look at equation 1-3). According to the national income model in equilibrium solution (Y*) obtained in 2b, answer the following questions:

i. What happen to the national income in equilibrium (Y*), if there is a change in government expenditure (G₀)? **(4 points)**
ii. Give your interpretation for the result obtained in point (i)! **(1 points)**
iii. What happen to the national income in equilibrium (Y*), if the b parameter changes? **(4 points)**
iv. Give your interpretation for the result obtained in point (iii). **(1 points)**

c. **(10 points)**

If the production function of a firm is known as given:

$Q = f(K, L) = [0.3L^{-3} + 0.3K^{-3}]^{-1/3}$.

Determine:

    i. *Marginal Productivity of Labor* (MP_L) **(5 points)**
    ii. *Marginal Productivity of Capital* (MP_K) **(5 points)**
 Note:
   MP_L is the change in output of production per unit change in labor (L)
   MP_K is the change in output of production per unit change in capital (K).

SOAL 4 (25%)

a. **(15 points)**
If the demand function of a good is given as; $Qd = 400 - 4P$, and the supply function of
the good is $Qs = 4P - 80$, determine:
   a. The level P and Q in equilibrium!**(5 points)**
   b. If the government impose a unit tax Rp. 20/ unit of goods sold, what is the
     new level of P and Q in equilibrium, after tax? **(5 points)**
   c. Graphically, determine the equilibrium of P and Q before (point a) and after
     (point b) tax. **(5 points)**

b. **(10 points)**
If there are 3 types of transportation mode, truck, ship and train, and each of the cost
function of the transportation modes are given as following;
$C = 100Q$ (truck),
$C = 4000 + 20Q$ (ship); and
$C = 5000 + 15Q$ (train),
Where Q is the volume of goods. Answer the following questions:

a. Draw the cost function of each transportation mode in **ONE** graph (there will be
   three curves)! **(4 points)**
b. If you have chosen ship as your transportation mode, how many volume of goods
   can you ship so the transportation cost is cheaper than the other transportation
   alternatives?*(hint: look at your graph)* **(6 points)**