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SCHOOL OF ACCOUNTING AND BUSINESS
BSc. (APPLIED ACCOUNTING) GENERAL / SPECIAL DEGREE
PROGRAMME

YEAR I SEMESTER I – INTAKE VII (GROUP A)
END SEMESTER EXAMINATION – JANUARY 2017

QMT 10130 Business Mathematics

Date : 13th February 2017
Time : 9.00 a.m. - 12.00 p.m
Duration : Three (03) hours

Instructions to Candidates:

- Answer **any Five (05)** questions.
- All questions carry equal marks.
- The total marks for the paper is 100.
- Formula Sheet is provided.
- Use of scientific calculator is allowed.
- Answers should be written neatly and legibly

Question No. 01

The cost (in thousand rupees) and revenue (in thousand rupees) functions of a company which produces a particular screw drivers are given by.

$$TR = 30Q - Q^2 \text{ and } TC = 4Q + 20$$

Where Q is the number of units of screw drivers produced. Assume that all the screw drivers produced can be sold without any restriction.

- i. Find the fixed cost.
- ii. Set up the profit function, π , for the above given company.
- iii. Find the derivative of the profit function with respect to the appropriate variable.
- iv. Find the critical points of the profit function, π .
- v. Find the appropriate second order derivative.
- vi. Find the number of screw drivers that should be produced to maximize the profits.
- vii. Find the maximum profit.

Question No. 02

The demand and supply functions of a commodity under perfect competition are given by $p_d = 104 - 3q^2$ and $p_s = q^2 + 4$ respectively. Where p and q are the price and the quantity.

- i. Find the equilibrium quantity and the equilibrium price.
- ii. Sketch the demand and the supply functions clearly stating all the required points.
- iii. Highlight the consumer and producer surpluses and indicate in the sketch.
- iv. Find the consumers' surplus clearly showing all your workings.
- v. Find the producers' surplus clearly showing all your workings.

Question No. 03

- i. If the marginal revenue function of a production is given by $MR = 40 - 18Q - Q^2$, using an appropriate mathematical technique find the revenue function and deduce the demand function.
- ii. Marginal cost function of a firm is given by $MC = \frac{d}{dQ}\{TC\} = 9 - 12Q + 3Q^2$
 - a. Find the Total Cost function, if the fixed cost is 15.
 - b. Find the number of items which minimizes the total cost, clearly indicate all the necessary steps.
 - c. Find the minimum cost.

Question No. 04

- i. A company involved in printing business intends to replace a printing machine in 6 years. The company estimates the cost on the new machine to be SLR 150000. Assuming an annual interest rate of 12% compounded monthly, what would be the size of each monthly investments that the company should make in order to buy the new printing machine? Assume that the first payment is made immediately.
- ii. Ms. Pumika is turned to 30 on 01 – 01 – 2016 so thinking of her future she started depositing a constant amount annually in an account on her birthday. She decided to continue these annual investments till 01 – 01 – 2045. The bank decided to pay 12% annual interest rate.
 - a. If Ms. Pumika plans to make 10 annual withdrawals of 2.5 million each starting from 01 – 01 – 2046. Calculate the total amount that should be available in the account on 01 – 01 – 2045 to make these withdrawals.
 - b. Calculate the amount that Ms. Pumika must invest at the beginning of each year from 01-01-2016

Question No. 05

- i. The elasticity of demand η is defined as $\eta = -\frac{p}{x} \frac{dx}{dp}$ where p is the price and x the number of units.

If a commodity has the demand function $x = 500 - 3p - 2p^2$ calculate the elasticity of demand when the price $p = 11$.

- ii. The profit function

$$\pi(Q_1, Q_2) = 720Q_1 + 408Q_2 - 48Q_1Q_2 - 72Q_1^2 - 36Q_2^2 + 4000$$

of a firm producing two commodities. Where Q_1 and Q_2 are number of units produced in product 1 and product 2 respectively.

- Find the two first order partial derivatives π_{Q_1} and π_{Q_2} .
- Set π_{Q_1} and π_{Q_2} equal to zero and solve for Q_1 and Q_2 .
- Find the required second order partial Derivatives.
- Evaluate the second order partial derivatives at the critical points obtained in part (b) .
- Show that the necessary second order condition for the extremum point holds at the critical point found in part (b)
- Find the extremum profit?

Question No. 06

- A credit card charges an annual rate of 12% compounded monthly. This month's bill is SLR 45000. The minimum payment is SLR 6500. Suppose that you plan to pay SLR 7500 each month for five months and the balance in the 6th month. Find the amount that should be made on the sixth month to settle the entire amount?
- Thirteen years back Mr. Ranjan took a mortgage of LKR 200000 over a property for 15 years at a rate 10% per annum.
 - Find the amount that Mr. Ranjan has to repay each month.

- b. After 10 years of the mortgage due to various political and financial reasons the interest rate increased to 12% per annum. Find the mortgage balance at the end of 10 years from the mortgage.
- c. Find the new monthly repayment of Mr. Ranjan after the increment in the interest rate.
- d. Due to the increase in interest rate how much Ms. Ranjan had to pay additionally.