Uva Wellassa University

Faculty of Management

SECOND YEAR FIRST SEMESTER EXAMINATION –FEBRUARY/MARCH 2012

HTE 231 – 2 Business Mathematics

HTE 281 – 2 Business Mathematics (Repeaters)

HTE 243 – 2 Business Mathematics (Repeaters)

Instructions to candidates:

No. of pages : Three (03)
No. of questions : Five (05)
Time allocation : Two (02) Hours
Marks allocation : 100 Marks

Answer only four (4) questions **including question no. (01)**
Calculators are allowed.

Index No:

01. Solve the following problems.

i. $y = \left(\frac{ax^2 - b}{cx}\right)$ Find dy/dx.

ii. $y = u^3 + 1$ Where $u = 5 - x^2$, find dy/dx using the Chain rule.

iii. $y = x^3 - 2x^2y + 3xy^2 - 22$, Find y_{xy} and y_{yx} and prove the Young's Theorem.

iv. $\int 8e^{2x+3}dx$

v. $\int_1^4 (ax^2 + bx + c)dx$

(5x5 = 25 Marks)

02. Marginal cost function of a firm is given as follows.

$$MC = 400 - 6Q + 6Q^2$$

The fixed cost of this firm is Rs.120

i. Find the Total Cost (TC) function of this firm.
ii. Find the Average Variable Cost (AVC) and Average Cost (AC) functions and find the output level that minimizes Average Variable Cost (AVC).
iii. Assume that, the demand curve of this firm is $P = 4000 - 33Q$. Find the optimum level output of this firm.
iv. Find the profit or loss at the optimum level output.
v. What will happen to the optimum output level in (iii), if the demand equation is changed such as $P = 4500 - 20Q$

(5x5 = 25 Marks)

03. Find critical points of the following functions and check whether there is a maximum, minimum, inflection point or saddle point at the critical points.

$$Z = 2x^2 - xy + 3y^2 - 4x - 6y + 10$$

$$f(x,y) = 48y - 3x^2 - 5xy - 4y^2 + 60x$$

$$Q_{xy} = 5x^2 - 4y^2 - 30x + 8y + 4xy$$

$$f(x,y) = 3x^2 - 9xy + 3y^3$$

$$z = 4x^2 - 3xy + 6y^2 + 3x - 6y - 10$$

(5x5 = 25 Marks)

04.

a)

i. Sketch the graphs of following two functions in one diagram.

$$y_1 = x^2 + 8x - 7$$
$$y_2 = 2x - 2$$

ii. Find the area between two curves.

Consider the given demand and supply functions.

$$P_D = 300 - 6Q - Q^2$$
$$P_S = Q^2 + 4Q$$

b)

i. Find the market equilibrium price and quantity.

ii. Calculate the consumer surplus.

iii. Calculate the producer surplus.

(5x5 = 25 Marks)

maximum,

05.

a) A Factory can produce four products: P, Q, R and S. To produce each product four parts A, B, C and D are required.

1 P requires 2 units of A, 6 units of B, 4 units of C and 4 units of D.

1 Q requires 3 units of A, 1 unit of B, 2 units of C and 3 units of D.

1 R requires 1 unit of A, 2 units of B, 7 units of C and 5 units of D.

1 S requires 5 units of A, 1 unit of B, 6 units of C and 4 units of D.

25 Marks)

i. Construct a 4 x 4 matrix which shows the number of each part required for each product, using parts as column headings.

ii. An order is received for 6Ps, 2Qs, 7Rs and 10Ss. Represent this order as a vector and use matrix multiplication to compute the total number of each part required to fulfill the order.

iii. The cost of 1 unit of A is £2.50, the cost of 1 unit of B is £3, the cost of 1 unit of C is £4 and the cost of 1 unit of D is £1.50. Express the costs as a vector and hence find the total cost of the order by matrix multiplication.

b) Let $A = \begin{bmatrix} -5 & 1 & -6 \\ 1 & 2 & 4 \\ 8 & 1 & -4 \end{bmatrix}$ $\quad B = \begin{bmatrix} 3 & 0 & 3 \\ 1 & 2 & 0 \\ 6 & 1 & -5 \end{bmatrix}$

25 Marks)

iv. Calculate the determinant of the matrix A.

v. Calculate the inverse of the matrix B

(5x5 = 25 Marks)