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# SCHOOL OF ACCOUNTING AND BUSINESS 

## BSc. (APPLIED ACCOUNTING) GENERAL / SPECIAL DEGREE PROGRAMME

# YEAR I SEMESTER I - INTAKE VIII (GROUP A) END SEMESTER EXAMINATION - JULY 2017 

## QMT 10130 Business Mathematics

| Date | $:$ | 27th July 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 .
- Use of scientific calculator is allowed.
- Answers should be written neatly and legibly


## Question No. 01

"Pizza Pizza" makes pizza and sells to their customers. The revenue from selling $x$ number of pizzas is $T R=a x+b x^{2}$ where $a$ and $b$ are real constants, similarly the cost to make $x$ number of pizzas is $T C=c+d x+e x^{2}$ where $c, d$ and $e$ are real constants.
i. Find the fixed cost.
ii. Set up the profit function, $\boldsymbol{\pi}$, of "Pizza Pizza".
iii. Find the derivative of the profit function with respect to the appropriate variable.
iv. Find the critical points of the profit function, $\boldsymbol{\pi}$.
v. Find the appropriate second order derivative.
vi. Find the number of units that should be produced to maximize the profits.
vii. Find the maximum profit.

## Question No. 02

The total cost function of a firm is found to be $\boldsymbol{T C}=\boldsymbol{x}^{\mathbf{3}}-\mathbf{1 5} \boldsymbol{x}^{\mathbf{2}}+\mathbf{1 3 0 x}+\mathbf{3 0}$ where $\boldsymbol{x}$ is the output. The new government has reduced the tax by Rs. 40 per unit of output to encourage the producers, so this particular producer deducted this amount from his cost to give the benefit to the customers. The market demand function is found to be $\boldsymbol{p}=\mathbf{7 5 9 0} \mathbf{- 1 5 x}$ through a study of the market. The notation $\boldsymbol{p}$ in the demand function stands for the price per unit of output.
i. Find the amended cost function.
ii. Create the Total Revenue function.
iii. Develop the Profit Function.
iv. Find the Marginal Profit function
v. Find the Critical points of the profit function.
vi. Calculate output and price that maximize the profit.

## Question No. 03

The revenue function $\boldsymbol{T R}=\mathbf{9 0 x}+\mathbf{5 1} \boldsymbol{y}-\mathbf{6 x y}-\mathbf{9} \boldsymbol{x}^{2}-\frac{\mathbf{9}}{\mathbf{2}} \boldsymbol{y}^{\mathbf{2}}+\mathbf{1 0 0 0}$ of a firm is assumed to have a monopoly on $X$ and $Y$.
i. Find the two first order partial derivatives of $\boldsymbol{T R}$.
ii. Set the partial derivatives found in part (i) equal to zero and solve for $x$ and $y$.
iii. Find all the second order partial derivatives of $\boldsymbol{T} \boldsymbol{R}$
iv. Evaluate the second order partial derivatives at the critical point/s obtained in part (ii).
v. Show that the required second order condition for the optimization holds at the critical point/s.
vi. Find the extremum profit.

## Question No. 04

The demand and supply functions under pure competition are given by $\boldsymbol{p}_{\mathbf{d}}=\mathbf{1 4 0}-\mathbf{2 q} \mathbf{q}^{\mathbf{2}}$ and $\boldsymbol{p}_{\mathbf{s}}=\mathbf{3} \boldsymbol{q}^{\mathbf{2}}+\mathbf{1 5}$ respectively. Where $\boldsymbol{p}$ and $\boldsymbol{q}$ 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 using the integration technique.
v. Find the producers' surplus using the integration technique.

## Question No. 05

i. The elasticity of demand $\eta$ is defined as $\boldsymbol{\eta}=-\frac{\boldsymbol{p}}{\boldsymbol{x}} \frac{\boldsymbol{d} \boldsymbol{x}}{\boldsymbol{d} \boldsymbol{p}}$. You are required to calculate the elasticity of demand for the demand function $\boldsymbol{x}=\mathbf{7 5}-\mathbf{2 p}-\mathbf{3} \boldsymbol{p}^{\mathbf{2}}$ when $\boldsymbol{p}=3$.
ii. A solution containing $12 \%$ alcohol is to be mixed with a solution containing 4\% alcohol to make 20 gallons of solution containing $9 \%$ alcohol.
a. Identify the unknowns to be evaluated in the above given problem.
b. Develop the system of simultaneous equations which represent the above problem.
c. Find the solution of the system of simultaneous equation you have developed in part (b), using a matrix method

## Question No. 06

i. A motor car costing Rs. 7 million depreciates by 20 percent during the first year, then by 16 percent per annum in each of the next three years, and by 10 percent per annum thereafter. Find the value of the motor car after 10 years.
ii. Mr. Shantha has taken out a Rs 4 million mortgage on a property at a rate of 16 percent per annum for 15 years, to settle his long term outstanding housing loan.
a. Calculate the amount that Mr. Shantha has to repay monthly.
b. After 10 years of the mortgage, Mr. Shantha receives a letter from the bank stating that the interest rate has been increased to 13 percent per annum. Recalculate the new monthly repayment figure.
c. Due to the increase in the interest rate how much the Mr. Shantha has to pay more?

$$
V=P(1+r)^{n} \quad P_{O D I}=R\left[\frac{1-(1+r)^{-n}}{r}\right] \quad A_{O D I}=R\left[\frac{(1+r)^{n}-1}{r}\right]
$$

