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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2017/2018 ACADEMIC YEAR ONE**

**THIRD TRIMESTER EXAMINATION**

**SCHOOL OF BUSINESS AND ECONOMICS**

**FOR THE DEGREE OF BACHELOR OF BUSINESS MANAGEMENT**

**COURSE CODE: BBM 115**

**COURSE TITLE: BUSINESS MATHEMATICS II**

**EXAMINATION DURATION: 3 HOURS**

**DATE: 08/08/18 TIME: 09.00-12.00 PM**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions**
* **Question ONE (1) is COMPULSORY**
* **Choose any other TWO (2) questions from the remaining FOUR (4) questions**
* **Use sketch diagrams to illustrate your answer whenever necessary**
* **Do not carry mobile phones or any other written materials in examination room**
* **Do not write on this paper**

**This paper consists of FIVE (5) printed pages *please turn over***

**You may find the following formulae useful to answer the questions in this paper.**

* Compound Interest Formula,
* Continuous compounding,
* Future Value of an annuity,
* Present value of an annuity,
* Loan amortization formula: Size of each payment,
* Simple linear regression equation: where
* Pearson Correlation Coeffecient,

**QUESTION ONE COMPULSORY**

1. Define the following terms as used in business: [**2 marks]**
2. an annuity
3. Present value of an annuity.
4. Find the local minimum of the function [**3 marks]**
5. Given that find  **[2 marks]**
6. Evaluate **[2 marks]**
7. The marginal cost (MC) function is given byand TC=100when Q = 0.Find the total cost (TC) function. **[3 marks]**
8. How long does it take to save $700,000 if you place $500 per month in an account paying 6% per year compounded monthly? **[3 marks]**
9. John intends to amortize a loan of $10,000 at a rate of 5% per year in six years. He decides to make annual equal payments at the end of each year. How much will John pay annually? **[3 marks]**
10. Given the demand function . Determine the revenue function and the marginal revenue function. **[4 marks]**
11. To save for retirement, Mary decides to deposit Ksh 206,000 into an account each year for the next 30 years. What will the value of the account be when she makes his 30th deposit? (Assume that the rate of return of the account is 4% per annum compounded annually) **[3 marks]**
12. A newly created state welfare agency wants to determine the number of analysts to hire to process the welfare applications. Efficiency experts estimate the average cost (C) of processing an application is a function of the number of analysts (x). Specifically, the cost function is given by:

Determine the number of analysts who should be hired in order to minimize the average cost per application. Show that the value obtained minimizes the cost. **[5 marks]**

**QUESTION TWO**

1. A production manager has compared the dexterity test scores of five assembly-line employees with their hourly productivity. The data are recorded in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Employee | 1 | 2 | 3 | 4 | 5 |
| Score on dexterity test ( | 12 | 14 | 17 | 16 | 11 |
| Units produced per hour | 55 | 63 | 67 | 70 | 51 |

1. Determine the least-squares regression line which may be used to predict the units produced per hour from the score on dexterity test.  **[5 marks]**
2. Estimate the hourly productivity of an employee whose score on dexterity test is 20 **[2 marks]**
3. Calculate the Karl-Pearson Correlation coefficient and comment on the value obtained **[4 marks]**
4. Differentiate with respect to , the following functions
5. **[3 marks]**
6. **[3 marks]**
7. **[3 marks]**

**QUESTION THREE**

1. Define the term loan amortization **[1 mark]**
2. Halima intends to amortize a loan of $15,000 at a rate of 6% per year in five years. She decides to make annual equal payments at the end of each year.
3. How much will Halima pay annually **[3 marks]**
4. Prepare a loan amortization schedule for the loan **[6 marks]**
5. Calculate the time it will take for a certain amount of money invested at a rate of 10% per year compounded quarterly to increase by 50%. **[3 marks]**
6. To provide for future education costs, a family makes deposits $9,269 in a savings account that pays an interest rate of 4% per year compounded continuously. What will be the amount of the savings after 3 years **[4 marks]**
7. How much money should be invested now at 12% per year so that after 4 years, the amount will be Ksh. 1,034,500 when the interest rate is compounded continuously [**3 marks]**

**QUESTION FOUR**

1. The output, Q for a firm over time, t in years is given by the function

Determine the years in which the output is at maximum and minimum. **[6 marks]**

1. The marginal revenue is given by . Find the revenue function. **[3 marks]**
2. The cost function of a firm is given by and the demand function is given by
3. Find the profit function (**). **[4 marks]**
4. Determine the marginal profit function and hence find the production level (), that will maximize the profit? **[4 marks]**
5. Using the second derivative, show that the production level () found in above, gives the maximum profit. **[3 marks]**

**QUESTION FIVE**

1. Evaluate **[3 marks]**
2. Find the area bounded by the curve , the x-axis and the lines , and .

**[3 marks]**

1. The marginal propensity to consume (MPC) out of national income Y is 0.6, find the corresponding savings function given that when **[3 marks]**
2. Mrs. Kimani has just purchased a $300,000 house and has made a down payment of $60,000. She plans to amortize the balance at 6% per year for 360 months. What is her total interest payment? **[4 marks]**
3. The demand function for a good is given by  , while the total cost (TC) is given by , where P is the price and Q is the quantity.
4. Write down expressions for the total revenue function and the marginal revenue function. **[3 marks]**
5. Write down the profit function () **[2 marks]**
6. Find algebraically, in terms of Q, when the firm breaks even and when makes a profit **[2 marks]**