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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2019/2020 ACADEMIC YEAR ONE**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF BUSINESS AND ECONOMICS**

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

**COURSE CODE: BBM 115(PSSP)**

**COURSE TITLE: BUSINESS MATHEMATICS II**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 15/12/2020 TIME: 3.00-4.00 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 FOUR (4) printed pages *please turn over***

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

1. Compound Interest Formula, $A=P\left(1+i\right)^{n}$
2. Continuous compounding, $A=Pe^{rt}$
3. Future Value of an annuity, $FV=R\left[\frac{\left(1+i\right)^{n}-1}{i}\right]$
4. Loan amortization, $P=V\left[\frac{i\left(1+i\right)^{n}}{\left(1+i\right)^{n}-1}\right]$

**QUESTION ONE (COMPULSORY)**

1. Define the following terms as used in business: **[2 marks]**
2. An annuity
3. A perpetuity

1. Find the derivative of the function $y= \frac{(3x+5)^{4}}{(6x-1)^{2}}$ **[6 marks]**
2. Given that $y=6x^{3}-9x^{2}+5x-10$ find$\frac{dy^{2}}{dx^{2}}$ when x= -2 **[5 marks]**
3. How long does it take to save $450,000 if you place $500 per month in an account paying 6% per year compounded monthly? **[5 marks]**
4. Given the demand function, P = 20 – 4Q $P=20-3Q$ . Determine the revenue function and the marginal revenue function. **[3 marks]**
5. Evaluate  **[3 marks]**
6. The marginal cost (MC) function is given by and  when. Find the total cost ** function**. [3 marks]**
7. Determine the present value of a series of 12 annual payments of $ 15,000 each, the first of which begins one year from today. Assume the interest rate is 8% per year compounded annually. **[3 marks]**

**QUESTION TWO (20 MARKS)**

1. Use the chain rule to find the derivative of $y$ with respect to $x$ given that;

$y=(3x^{2}- 2)^{4}$ **[4 marks]**

1. Differentiate with respect to $x$, the function $y=(2x+1)^{3}(5x^{2}-1)^{4}$ **[5 marks]**
2. Find the slope of the function $f\left(x\right)=6x^{2}-0.5x^{3}$ when $x=10$ **[3 marks]**
3. How much money should be invested now at 8% per year so that after 4 years, the amount will be Ksh. 1,034,500 when the interest rate is compounded continuously **[3 marks]**
4. i) Define the term loan amortization **[1 mark]**

 ii) 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 **[4 marks]**

**QUESTION THREE (20 MARKS)**

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

$$Q=\frac{t^{3}}{30}-\frac{t^{2}}{5}+\frac{3t}{10}+120$$

Determine the years in which the output is at maximum and minimum **[5 marks]**

1. The cost function of a firm is given by C$=680+4Q+0.1Q^{2}$ and the demand function is given by$P=12-\frac{Q}{500}$
2. Find the profit () function. **[3 marks]**
3. Determine the marginal profit function and hence find the production level ($q$) that will maximize the profit? **[3 marks]**
4. Using the second derivative, confirm that the production level ($q$) found in $(ii) $above, will give the maximum profit. **[3 marks]**
5. What is the maximum profit? **[1 mark]**

(c) 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 **[5 marks]**

**QUESTION FOUR (20 MARKS)**

1. Define the following terms as used in business:
2. Sinking fund
3. amortization
4. loan amortization schedule (3 marks)
5. Trump and Sharon are partners in a company and their capitals are in the ratio 3:5. Trump and Sharon shared the yearly profit in the ratio 3: 2 and Sharon had joined the business some months after Trump had started it. Find the period of investment of Sharon. (4 marks)
6. An insurance agent gets commission of 15 % on first year premium, 3 % on second and third year‘s premium and 2 % on subsequent years premium on an insurance policy of Ksh. 100,000. Annual rate of premium being Ksh. 100 per thousand. Find the total earning of the agent for which 5 annual premiums have been paid. (5 marks)
7. 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 | 6 | 7 |
| Score on dexterity test ($x)$ | 12  | 14  | 17  | 10 | 13 | 16  | 11  |
| Units produced per hour $(y)$ | 55 | 63  | 67  | 58 | 60 | 70  | 51 |

Determine the least squares regression line, which may be used to predict the units, produced per hour from the score on dexterity test. [**8 marks]**

**QUESTION FIVE(20 MARKS)**

1. The marginal propensity to consume (MPC) out of national income Y is 0.65. Find the corresponding savings function$(S)$ given that $S=-45$ when$Y=0$ **[5 marks]**
2. A sum of money double itself at compound interest in 10 years. In how many years will it become 6 times its original value? [**5 marks]**
3. Calculate the correlation coefficient between the two variables x and y shown below

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| x | 10 | 12 | 11 | 13 | 12 | 14 | 9 | 12 | 14 | 13 |
| y | 7 | 9 | 12 | 9 | 13 | 8 | 10 | 12 | 7 | 13 |

 [**10 marks]**