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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2020/2021 ACADEMIC YEAR ONE**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF BUSINESS AND ECONOMICS**

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

**COURSE CODE: BBM 123**

**COURSE TITLE: BUSINESS MATHEMATICS II**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 19/08/2021 TIME: 3.00-5.00 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 TWO (2) printed pages *please turn over***

**QUESTION ONE (COMPULSORY)**

1. A company wants to pro­­vide a retirement plan for an employee who is aged 55 now. The plan will provide her with an annuity immediate of Shs 7,000 every year for $15$ years upon her retirement at the age of 65. The company is funding this plan with an annuity due of $10$ years. If the rate of interest is 5%. What is the amount of installment the company should pay? (3 Marks)
2. Find the derivative of
3. 
4.  (4 Marks)
5. A firm has analyzed their operating conditions, prices and costs and have developed the following functions

and  where Q is the number of units sold. The firm wishes to maximize profit and wishes to know

1. What quantity should be sold
2. At what price
3. What will be the amount of profit? (7 Marks)
4. Find the present value that must be deposited now so as to amount to Kshs 95,000 in 4 years at 8% interest compounded monthly [4 Marks]
5. Samuel bought TV on hire purchase from ART. He made a down payment of 20% of the cash of the TV which was Kshs. 20,000. If he promised to pay up in 18 month installments on monthly basis, how much were his monthly instalments bearing in mind that the retailer charged 20% interest compounded quarterly on the unpaid balance? [5 Marks]
6. Evaluate
7.  (3 Marks)
8.  (4 Marks)

**QUESTION TWO**

1. Construct an amortization schedule of a loan of 15,000 shillings to be paid over 6 years with a 6 payment annuity immediate at effective rate of interest of 6% per year (10 Marks)
2. The demand for the profit of a firm varies with the price that the firm charges for the product. The firm estimate that the annual total revenue R (stated in 1000s’) as a function of the price Pis given by 
3. Determine the price, which should be charged in order to maximize total revenue
4. What is the maximum value of the total revenue (5 Marks)
5. Find the sum of the present value of two payments of Ksh 5000 to be paid at the end of 4 and 9
6. If interest is compounded semiannually at the nominal rate of 8% per year (3 Marks)
7. The simple interest method of 8% (2 Marks)

**QUESTION THREE**

1. A study was conducted to find whether there is any relationship between the weight and blood pressure of an individual. The following set of data was arrived at from a clinical study

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Weight(x) | 78 | 86 | 72 | 82 | 80 | 86 | 84 | 89 | 68 | 71 |
| Blood Pressure (y) | 140 | 160 | 134 | 144 | 180 | 176 | 174 | 178 | 128 | 132 |

1. Find the least square regression equation relating the blood pressure (y) of the individual to their weight (x) [9 Marks]
2. Calculate the Pearson Product Moment correlation coefficient for the data. Comment on your result. [4 Marks]
3. Estimate the weight of an individual whose blood pressure is 150 [1 Marks]
4. A retailer of motorized bicycles has examined cost data and has determined a cost function which expresses the annual cost of purchasing, owning, and maintaining inventory as a function of the size of each order it places on bicycles. The cost function is

where C equals annual inventory cost, stated in dollars and q equals the number of cycles ordered each time the retailer replenishes the supply

1. Determine the order size, which minimizes annual inventory cost
2. What is minimum inventory cost expected [6 Marks]

**QUESTION FOUR**

1. ABC Ltd employed a cost accountant who developed two function to describe the operation of the firm. He found the marginal function to be and the marginal cost function to be where x is the level of output. Determine the profit maximizing output and the total profit at that point (7 Marks)
2. Fit a straight line trend equation by the method of least square and estimate the trend values

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Years  | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 |
| values | 80 | 90 | 92 | 83 | 94 | 99 | 92 | 104 |

 [10 Marks]

1. Calculate the rate of interest of Kshs. 16,400 earning Kshs. 615 in 16 months [3 Marks]

**QUESTION FIVE**

1. Define the term time series and discuss four components of a time series [5 Marks]
2. Assuming a 5 yearly moving average, calculate trend value from the data given below and plot the results on a graph [8 Marks]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year  | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
| Production (thousands ) | 105 | 107 | 109 | 112 | 114 | 116 | 118 | 121 | 123 | 124 | 125 | 127 | 129 |

1. A public transportation company has been experimenting on a possibility of developing a system of charging fares. The demand function which is expresses a ridership as a function of fare charged is given below

 where Q equals the average number of riders per hour and P equals the fare in shillings

1. Determine the fare, which should be charged in order to maximize hourly bus fare revenue
2. What is the expected maximum Revenue?
3. How many riders per hour are expected (5 Marks)
4. In February 2008, Kamau earned a salary of Kshs. 58,000. His income tax is calculated at 30% of his taxable income while the NHIF deducted was Kshs. 200 and pension 2% of his gross salary calculate the net pay [2 Marks]