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**GARISSA UNIVERSITY**

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

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF SCHOOL OF PURE AND APPLIED SCIENCES**

**FOR THE DEGREE OF BACHELOR OF EDUCATION**

**COURSE CODE: STA 115**

**COURSE TITLE: INTRODUCTION TO MATHEMATICS FOR FINANCE**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 11/12/2020 TIME: 03.00-05.00 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***

**QUESTION ONE (COMPULSORY)**

1. Determine the following terms **[3 marks]**
2. Market equilibrium
3. Present value of annuity
4. A sinking fund
5. If , find all the values of *x* such that **[3 marks]**
6. A revenue function is given by .

When Q= 5, R= 50 whereas when Q= 4, R= 48. Determine the revenue function. **[4 marks]**

1. The table below shows the values of function at different points of .

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| --- | --- | --- | --- | --- | --- |
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1. Giving a reason, state whether function is an exponential or not. **[2 marks]**
2. If is an exponential function, find an exponential function that models the data. **[2 marks]**
3. How much should be deposited in a bank account that pays an interest of 6% per year compounded continuously so that after 3 years the amount will be Ksh. 1,032,000 [**3 marks]**
4. Given that matrix and

Show that **[2 marks]**

1. Solve the following system of equations using matrix inverse. **[3 marks]**



1. Use the Gauss-Jordan method to find the inverse of Matrix below:

**[6 marks]**

**QUESTION TWO**

1. Define a linear function and state two characteristics of a linear function. **[3 marks]**
2. A firm has a budget of $ 3,000 to spend on two items X and Y. Item X costs $ 50 per unit, and item Y costs $ 30 per unit.
3. State the budget constraint equation for this firm.
4. If the firm purchased 12 units of item X, how many of item Y could they purchase given their budget of $ 3,000. **[3 marks]**
5. Between 9:00 PM and 10:00 PM cars arrive at Burger King’s drive-thru at the rate of 12 cars per hour (0.2 car per minute). The following formula from statistics can be used to determine the probability that a car will arrive within minutes of 9:00 PM.
6. Determine the probability that a car will arrive within 30 minutes of 9 PM.
7. What value does approach as increases without bound in the positive direction? **[3 marks]**
8. Find the range and the horizontal asymptote **[3 marks]**
9. Find the domain and the vertical asymptote of asymptote **[4 marks]**
10. Solve the equation

**[4 marks]**

**QUESTION THREE**

1. Suppose the price of a commodity is $7 per unit when quantity demanded is 20 units, and the price is $5 per unit when the quantity demanded is 34 units. Find the equation for the demand curve. [3 marks]
2. The fixed costs of a firm are £500. The firm has a variable cost of £9 per unit of item X produced. Product X sells for £13 per unit. Calculate the number of units of item X the firm needs to produce in order to break-even. [4 marks]
3. Suppose a certain commodity has linear demand and supply functions goings through the following points.
4. Function (i): When P= Sh. **7500**, q= **1000** units; and when P= Sh. **4625**, q= **750** units
5. Function (ii): When P= Sh. 2525, q= 100 units; and when P= Sh. 1525, q= 200 units

Where P is the price and q is the quantity.

1. Obtain the linear functions that go through the points given in function (i) and function (ii) above.  **[6 marks]**
2. Clearly explain which function represents the supply and which function represents the demand. Assume this is a normal commodity.  **[3 marks]**
3. Calculate the market equilibrium for the above supply and demand function. Briefly explain what is meant by market equilibrium. **[4 marks]**

**QUESTION FOUR**

1. Use Cramer’s Rule to solve the following system of equations by using. **[10 marks]**
2. What is linear programming? **[1 mark]**
3. Define the following terms as used in linear programming. **[3 marks]**
4. A feasible solution
5. An infeasible solution
6. An optimal solution
7. A businesswoman operates a bakery that makes two types of cakes (X and Y). She uses two resources: flour and sugar. To make one packet of X, she need 3 kg of flour and 2 kg of sugar. To make one packet of Y, she needs 3 kg of flour and 4 kg of sugar. The bakery has 21 kg of flour and 28 kg of sugar. The cakes X and Y are sold at $ 10 and $ 9 per packet respectively. The businesswoman wants to find the best product mix that can maximize the revenue.
8. State the objective function associated with the problem. **[2 marks]**
9. Formulate other inequalities that can be used to solve the above problem. **[3 marks]**

**QUESTION FIVE**

1. Three persons A, B and C possess Sh.3000, Sh.2000 and Sh.2500 respectively. Person A with his entire amount purchased 5 shares of Sh. X each, 3 shares of Sh. Y each and 4 shares of Sh. Z each. Person B purchased 3 shares of Sh. X each, 4 shares of Sh. Y each and 2 shares of Sh. Z each with his entire amount and person C purchased 4 shares of Sh. X each, 3 shares of Sh. Y each and 4 shares of Sh. Z each with his entire amount. Determine the value of each share of different type. [**10 marks]**
2. A businesswoman intends to amortize a loan of Ksh 3,000,000 in 5 years by paying equal annual installments. If the interest rate is 8% per year, prepare the amortization schedule for this loan.  **[10 marks]**