**GARISSA UNIVERSITY**

**SCHOOL OF BUSINESS AND ECONOMICS**

**BBM 113: BUSINESS MATHEMATICS 1**

**END OF SEMESTER EXAMINATION**

**JAN/APRIL 2021**

**INSTRUCTIONS**

**ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.**

**QUESTION ONE 30 MARKS (COMPULSORY)**

1 a) Find what value of k would the matrix 2k +1 5 be singular (4marks)

4 2

b) Given that: A= 1 2 1 0

And I = Find

2 1 0 1

1. A2 – 2A + 4I (3marks) ii) A3 - 3A + 3I (3marks)

c) Consider the sets:

*A* = {red, green, blue}  
*B* = {red, yellow, orange}  
*C* = {red, orange, yellow, green, blue, purple} Find the following:

1. Find *A*⋃*B (2marks)*
2. Find *A*⋂*B (2marks)*
3. Find *Ac*⋂*C (3marks)*

d) A company has fixed costs of $7,000 for plant and equipment and variable costs of $600 for each unit of output. What is total cost at 15 and 30 unit of output respectively? (5marks)

e) For the function *f (x)* = 2*x2* + 3*x* - 1 evaluate

i. *f*(2) (2 marks)

ii. *f*(*a*) (2 marks)

iii. *f*(*a+h*) (4 marks)

**QUESTION TWO (20MARKS)**

1. I) State three uses of Business mathematics in Business (3 marks)
2. A company receives $45 for each unit of output sold. It has a variable cost of $25 per item and a fixed cost of $1600..what is its profit if it sells (a) 75 items (2marks) (b) 150 items (2marks) (c) 200 items(2marks)
3. Use matrix method to solve the following simultaneous equations: (5marks)

x + 2y = 5

2x + 3y = 2

1. Given the following equations for two related markets *(A)* and *(B).* Find the equilibrium conditions for each market. Also find the equilibrium price for each market.

*Qd* (*A*) = 82 – 3*PA* + *PB Qd* (*B*) = 92 + 2*PA* - 4*PB*

*Qs* (*A*) = -5 + 15*PA Qs* (*A*) = -6 + 32*PB*

Where *Qd* and *Qs* denote quantity demanded and quantity supplied respectively.(6 marks)

**QUESTION THREE (20MARKS)**

3 a) state and explain two applications of linear programming in the field of business (4marks)

b) A farmer has recently acquired a 110 hectares piece of land. He has decided to grow Wheat and barley on that land. Due to the quality of the sun and the region’s excellent climate, the entire production of Wheat and Barley can be sold. He wants to know how to plant each variety in the 110 hectares, given the costs, net profits and labor requirements according to the data shown below:

|  |  |  |  |
| --- | --- | --- | --- |
| Variety | Cost (Price/Hec) | Net Profit (Price/Hec) | Man-days/Hec |
| Wheat | 100 | 50 | 10 |
| Barley | 200 | 120 | 30 |

The farmer has a budget of US$10,000 and availability of 1,200 man-days during the planning horizon. Find a) the optimal solution and the optimal value.(8 marks)

b) Use graphical method to represent the information showing all the required regions. (8 marks)

**QUESTION FOUR (20 MARKS)**

1. (a) Differentiate between Sets and Subset (4marks)

(b) If A={1,2,3,4,5,6,7,8} and B{1,3,5,7}, then find

 (i) A∪B (3marks) (ii) A−B (2marks)   (iii) A∩B (3marks)

C) if A = 7 -3 -3 and B = 1 3 3 Find

-1 1 0 1 4 3

-1 0 1 1 3 4

1. A + B (3marks) ii) AB (5marks)

**QUESTION FIVE (20MARKS)**

5. (a) i) What is meant by Markov process

1. State characteristic of Markov process

(b) A petrol station owner is considering the effect on his business (Superpet) of a new petrol station (Global) which has opened just down the road. Currently (of the total market shared between Superpet and Global) Superpet has 80% of the market and Global has 20%.

Analysis over the last week has indicated the following probabilities for customers switching the station they stop at each week:

To

Superpet Global

From Superpet 0.75 0.25

Global 0.55 0.45

* What will be the expected market share for Superpet and Global after another two weeks have past?
* What would be the long-run prediction for the expected market share for Superpet and Global?