JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF AGRICULTURAL AND FOOD SCIENCES

SECOND YEAR SECOND SEMESTER UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN AGRIBUSINESSMANAGEMENT

2019/2020 ACADEMIC YEAR

REGULAR

COURSE CODE: BBM 3226

COURSE TITLE: OPERATIONS RESEARCH

EXAM VENUE: **STREAM: BSc. Agribusiness Management**

DATE: **EXAM SESSION:**

TIME: 2 HOURS

Instructions:

1. **Answer ALL questions in section A and ANY other 2 Questions in section B.**
2. **Candidates are advised not to write on question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

SECTION A [30 MARKS]
ANSWER ALL QUESTIONS

QUESTION ONE [6 MARKS]

Define the terms:

a. Decision variables [2 marks]

b. Corner Point Feasible (CPF) solutions [2 marks]

c. Mixed strategies in games theory [2 marks]

QUESTION TWO [6 MARKS]

a. Distinguish a game with a saddle point and one without a saddle point [2 marks]

b. Find the saddle point and value of the game with the following payoff matrix [4 marks]

	B			
A	10	20	-20	13
	12	14	0	15
	7	2	18	9

QUESTION THREE [9 MARKS]

a. Evaluate the initial basic solution for the transportation problem

16	19	12	14
22	13	19	16
14	28	8	12
10	15	17	42

[5 marks]

b. Form the dual of the following LP problem

Maximum $z= 3x_1 + 2x_2$

Subject to: $2x_1 + x_2 \leq 6$

$3x_1 – x_2 = 8$

$x_1 + x_2 \leq 2$

$x_1, x_2 \geq 0$ [4 marks]

QUESTION FOUR [9 MARKS]

a. Draw the constraints; $x_1 + 3x_2 \leq 6$, $4x_1 + 3x_2 \leq 12$, $4x_1 + x_2 \leq 8$ on the same axes to show the feasible region [6 marks]

b. Identify values of the decision variables that would optimize the objective function maximize: $z = 3x_1 + 5x_2$ [3 marks]

SECTION B: [20 MARKS]

ANSWER ANY TWO QUESTIONS

QUESTION FIVE [20 MARKS]

a. Consider the following payoff (profit) matrix

	θ_1	θ_2	θ_3	θ_4	θ_5
a	15	10	0	-6	17
a_2	3	14	8	9	2
a_3	1	5	14	20	-3
a_4	7	19	10	2	0

No probabilities are known for occurrence of the nature states. Determine the decisions that can be made using each of the following criteria:

i. Laplace [2 marks]

ii. Maximin [3 marks]

iii. Hurwicz (assume α= 0.25) [3 marks]

b. For the LP problem: Maximize: $Z= 2x_1 - x_2 + x_3$

Subject to: $3x_1 + x_2 + x_3 \leq 6$

$x_1 - x_2 + 2x_3 \leq 1$

$x_1 + x_2 - x_3 \leq 2$

$x_1 \leq 0, x_2 \leq 0, x_3 \leq 0$

i. Formulate a Simplex tableau to find the Initial Basic Solution [3 marks]

ii. Determine values of the decision variables that give optimal solution [7 marks]

iii. Find the optimal solution [2 marks]

QUESTION SIX [20 MARKS]

a. Distinguish between decisions under risk and decisions under uncertainty [4 marks]

Consider the following payoff (profit) matrix

	θ_1	θ_2	θ_3	θ_4
a_1	10	20	-20	13
a_2	12	14	0	15
a_3	7	2	18	9

The a priori probabilities of $\theta_{1,}$ $\theta_{1,}$ $\theta_{1,}$ θ_1 are 0.2, 0.1, 0.3, 0.4 respectively. An experiment is conducted and its outcomes z_1, z_2 are described by the following probabilities.

	θ_1	θ_2	θ_3	θ_4
z_1	0.1	0.2	0.7	0.4
z_2	0.9	0.8	0.3	0.6

b. Determine the best action when no data are used [8 marks]

c. Determine the best action when the experimental data are used [8 marks]

QUESTION SEVEN [20 MARKS]

a. Define a two-person zero-sum game [2 marks]

b. For the game

		B		
		1	2	3
	1	5	50	50
A	2	1	1	0.1
	3	10	1	10

i. Show that the strategies (1/6, 0, 5/6) for player A and (49/54, 5/54, 0) for player B are optimal [6 marks]

ii. Find the value of the game [3 marks]

c. Solve the following game problem graphically

	B	
	1	2
	5	6
A	-7	9
	-4	-3
	2	1

[9 marks]

QUESTION EIGHT [20 MARKS]

A transportation problem is as shown below.

		R	S	Supply
	P	8	5	4
Source	Q	6	4	2
	Demand	3	3	

a. Find the Initial Basic Solution (BS) using the North-West Corner method [5 marks]

b. Solve the problem to show how Demand-Supply process in realized [8 marks]

c. For the game:

	B			
	4	-4	-5	6
A	-3	-4	-9	-2
	6	7	-8	-9
	7	3	-9	5

Find: i. the saddle point [4 marks]

ii. the value of the game [3 marks]