



MACHAKOS UNIVERSITY

University Examinations for 2016/2017 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

THIRD YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF ECONOMICS AND FINANCE

BACHELOR OF ECONOMICS AND STATISTICS

BACHELOR OF ECONOMICS

BACHELOR OF COMMERCE

EES 302: OPERATIONS RESEARCH

DATE: 3/8/2017

TIME: 2:00 – 4:00 PM

INSTRUCTIONS TO CANDIDATES

- a) Answer Question ONE and any other TWO questions.**
- b) Begin answering a new question on a separate page on the booklet provided**
- c) Credit will be given to the clarity of argument and use of local examples.**

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) A firm produces three products X_1 , X_2 and X_3 . It uses two resources; man hours and raw materials.
- To produce a unit of X_1 , the firm requires 6 hours and 2 units of raw materials.
 - To produce a unit of X_2 , the firm requires 3 hours and 2 units of raw materials.
 - To produce a unit of X_3 , the firm requires 5 hours and 10 units of raw materials.

Only 30 man hours and 50 units of raw materials are available. If profits per unit of product X_1 , X_2 and X_3 are 30, 24 and 60 respectively;

Formulate the linear programming problem for the firm and solve for the optimal solution.

(15 marks)

b) Let the primal problem be

$$\text{Max } \pi = 5X_1 + 3X_2$$

s. t

$$6X_1 + 2X_2 \leq 36$$

$$5X_1 + 5X_2 \leq 40$$

$$2X_1 + 4X_2 \leq 28$$

$$X_1, X_2 \geq 0$$

Formulate the corresponding Dual problem

(15 marks)

QUESTION TWO (20MARKS)

.Consider a company that has a transportation schedule consisting of three sources and four destinations. The unit cost of transporting, the items from every source to every source to every destinations, the availability from each source and the requirements to each destinations are as follows

	D ₁	D ₂	D ₃	D ₄	SUPPLY
S ₁	5	2	4	3	60
S ₂	6	4	9	5	60
S ₃	2	3	8	1	90
Demand	50	65	65	30	210

a) Use the North-West Corner method to find the basic feasible solution.

(10 marks)

b) Find the optimal solution using a modified distribution method (MOD) or the stepping

stone method (SSN)

(10 marks)

QUESTION THREE (20 MARKS)

- a) Give four characteristics of assignment problem (4 marks)
- b) Assume there are four contractor and four jobs to be done

The bids for each job by each contractor are summarized in the following table where

C= contractor and J= job.

	C₁	C₂	C₃	C₄
J₁	15	13	14	17
J₂	11	12	15	13
J₃	13	12	10	11
J₄	15	17	14	16

Find the optimal assignment when M=N

(16 marks)

QUESTION FOUR (20 MARKS)

- a) Consider 3 sales people A, B, and C to be assigned to 3 regions R,S and T based on the following sales figure

	R	S	T
A	8	6	10
B	11	9	6
C	4	7	5

Solve the transshipment problem above for the optimal values

(10 marks)

- a) Fraser city has a group of five social workers. The director of the group wishes to assign each of the workers to a residential area in the best possible manner. It was suggested that workers be rotated in the various areas for a few weeks and their efficiency measured by the number of complaints received. The table below gives the number of complaints in each area against each worker in one month of service.

ZONE	I	II	III	IV	V
WORKER					
A	3	5	4	8	2
B	9	4	3	6	7
C	11	6	8	10	9
D	6	10	4	12	5
E	3	5	6	4	9

Suggest the best assignment of workers to zones (10 marks)

QUESTION FIVE (20 MARKS)

- a) Explain three basic functions of project Management (6 marks)
- b) Set up the project network showing the various activities and durations (5 marks)
- c) Determine the critical path hence the critical activities of the project (5 marks)
- d) What is the longest period that the project can take to complete? (4 marks)