MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR
THIRD YEAR FIRST SEMESTER

SCHOOL OF SCIENCE
BACHELOR OF SCIENCE MATHEMATICS

COURSE CODE: MAT 315
COURSE TITLE: OPERATION RESEARCH I

DATE: 19/04/ 2018 **TIME: 8:30-10.30 AM**

INSTRUCTIONS TO CANDIDATES

1. Answer Question **ONE** and any other **TWO** questions
2. Show all your working and be neat
3. Do not write on the question paper

*This paper consists of **FOUR** printed pages. Please turn over.*

QUESTION ONE (30 MARKS)

a) Define the following terms as used in Operation Research

   a) Objective Function (1 Mark)

   b) Feasible Solution (1 Mark)

   c) Feasible Region (1 Mark)

   d) Decision Variables (1 Mark)

   e) Shadow Price (1 Mark)

	D_1	D_2	D_3	D_4	Supply
Q_1	6	4	1	5	14
Q_2	8	9	2	7	16
Q_3	4	3	6	2	5
Required	6	10	15	4	35

b) Determine an initial basic feasible solution to the following transportation problem using N.W.C.R

(7marks)

c) Define a convex analysis (1 mark)

d) State two process steps of simplex method and by use of illustration (4marks)

e) Write a general mathematical model for the factory planning problem, which looks as follows.

Max $c_1x_1 + c_2x_2 + c_3x_3 + ... + c_nx_n = z$

Subject to $a_{11}x_1 + a_{12}x_2 + a_{13}x_3 + ...a_{1n}x_n \le b_1$

$a_{21}x_1 + a_{22}x_2 + a_{23}x_3 + ...a_{2n}x_n \le b_2$

: : :

$a_{m1}x_1 + a_{m2}x_2 + a_{m3}x_3 + ...a_{mn}x_n \le b_m$ (6 marks)

f) Describe the dual problem formulation when the original problem is in the standard form

(8marks)

QUESTION TWO (20 MARKS)

a) State and explain significant advantages of a model (5marks)

b) Briefly discuss on the methodology involve in operation research (5marks)

c) A company owns two flour mills viz. A and B, which have different production capacities for high, medium and low quality flour. The company has entered a contract to supply flour to a firm every month with at least 8, 12 and 24 quintals of high, medium and low quality respectively. It costs the company Rs.2000 and Rs.1500 per day to run mill A and B respectively. On a day, Mill A produces 6, 2 and 4 quintals of high, medium and low quality flour, Mill B produces 2, 4 and 12 quintals of high, medium and low quality flour respectively.

i. How many days per month should each mill be operated in order to meet the contract order most economically. (6 marks)

ii. Find graphically the feasible region and the optimal solution. (4marks)

QUESTION THREE (20 MARKS)

a) State the procedures for solving LPP by graphical method (7marks)

b) Solve the following LPP by graphical method.

Minimize $Z = 20X_1 + 10X_2$

Subject to $X_1 + 2X_2 \leq 40$

$3X_1 + X_2 \geq 30$

$4X_1 + 3X_2 \geq 60$

$X_1, X_2 \geq 0$ (8marks)

c) Discuss the formulating a linear program (5 marks)

QUESTION FOUR (20 MARKS)

a) States the development stages of operation research (5marks)

b) States five characteristics which a good model must possess (5marks)

c) A farmer has a 100 acre farm. He can sell all tomatoes, lettuce or radishes and can raise the price to obtain Re 1.00 per kg for tomatoes, Rs 0.75 a head for lettuce and Rs 2.00 per kg for radishes. The average yield per acre is 2000kg of tomatoes, 3000 heads of lettuce and 1000 kgs of radishes. Fertilizers are available at Rs.0.50 per kg and the amount required per acre is 100 kg each for tomatoes and lettuce and 50 kgs for radishes. Labour required for sowing, cultivating and harvesting per acre is 5 man-days for tomatoes and radishes and 6 man-days for lettuce. A total of 400 man-days of labour are available at Rs 20,000 per man-day. Formulate this problem as a linear programming model to maximize the farmer's total profit.

(10marks)

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