



# TECHNICAL UNIVERSITY OF MOMBASA

## FACULTY OF ENGINEERING AND TECHNOLOGY

### DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

#### UNIVERSITY EXAMINATION FOR:

#### BSC. MECHANICAL ENGINEERING Y5S2

#### EMG 2518: OPERATIONS RESEARCH

#### END OF SEMESTER EXAMINATION

**SERIES:** APRIL 2016

**TIME:** 2 HOURS

**DATE:** Pick Date Select Month Pick Year

#### Instructions to Candidates

You should have the following for this examination

*-Answer Booklet, examination pass and student ID*

This paper consists of five questions. Attempt any THREE questions.

**Do not write on the question paper.**

#### Question ONE

- a. Operational Research can be regarded as a scientific approach to the analysis and solution of management problems. Explain eight areas in which operations research is applied in providing solution to business problems  
(8Marks)
- b. A company employs service engineers based at various locations throughout the country to service and repair their equipment installed in customers' premises. Four requests for service have been received and the company finds that four engineers are available. The distance each of the engineers is from the various customers is given in the following table.

**Required:** Assign the engineers to the customers to minimize the total distance to be travelled.

Customers \ Engineers	W	X	Y	Z
Alf	25	18	23	14
Bill	38	15	53	23
Charlie	15	17	41	30
Dave	26	28	36	29

Distances in miles from

Engineers to customers **(12 marks)**

## Question TWO

A firm produces two products, X and Y with a contribution of £8 and £10 per unit respectively. The production data is given in the table below per unit

Products	Labour hours	Material A	Material B
X	3	4	6
Y	5	2	8
Total available	500	350	800

**Required:** Formulate the linear programming model and establish a production plan that maximizes contribution graphically **(20marks)**

## Question THREE

The following information is available for a project

Activity	Preceding activity	Duration (days)
1	-	4
2	1	7
3	1	5
4	1	6
5	2	2
6	3	3
7	5	5
8	2, 6	11
9	7, 8	7
10	3	4
11	4	3
12	9, 10, 11	4

**Required:**

- Draw the project network indicating the earliest start times and latest start times
- Determine the critical path and the project completion time
- Calculate the total float for the non-critical activities

**( 20 Marks)**

## Question FOUR

Whether as a result of deliberate policy or not, stock represents an investment by the organization. As with any other investment, the costs of holding stock must be related to the benefits to be gained. Identify three categories of costs and in each case enumerate the costs incurred. **(20 marks)**

## Question FIVE

(a) Briefly explain the meaning of JIT and how it operates

**(5 marks)**

(b) Discuss the five key goals of JIT

**(15 marks)**