



# KIBABII UNIVERSITY

2017/2018 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER

SUPPLEMENTARY EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE IN RENEWABLE ENERGY AND  
BIOFUELS TECHNOLOGY

COURSE CODE: IET 281

COURSE TITLE: OPERATIONS RESEARCH

DATE: 18/10/18

11.30 am -

TIME: 3 hours

INSTRUCTIONS TO CANDIDATES

This paper consists of TWO sections: A and B

Section A is Compulsory. Attempt any TWO questions from section B

This paper consists of 4 printed pages. Please Turn over

**SECTION A: COMPULSORY**

**QUESTION ONE (30 MARKS)**

(a) Explain the following terms applied in Programme Evaluation Review Technique.

(i) Dummy activity

(ii) event

(6 marks)

(b) (i) Highlight FOUR types of Inventory control applied in Industry

(ii) List TWO **advantages** of Inventory control

(6 marks)

(c) (i) Define a 'markov process' and State FOUR applications

(ii) Describe the term "Two Person- zero sum game" as it is applied in Operations Research

(6 marks)

(e) Use the graphical method to solve the Linear Program

$$\text{Maximize } Z = 2x_1 + 3x_2$$

$$\text{Subject to } 2x_1 + x_2 \leq 4$$

$$x_1 + 2x_2 \leq 5$$

$$x_1, x_2 \geq 0$$

(6 marks)

(d) (i) State FOUR limitations of operation's Research

(ii) Highlight FOUR applications of Operations Research.

(6 marks)

**SECTION B: ATTEMPT ANY TWO QUESTIONS FROM THIS SECTION (40 MARKS)**

**QUESTION TWO (20 MARKS)**

Determine the optimal strategies and comment on the results obtained for company Y and Z from the pay off matrix in Fig 1.

		Z		
		I	II	III
Y	I	-2	14	-2
	II	-5	-6	-4
	III	-6	20	-8

Fig. 1

(20 marks)

**QUESTION THREE (20 MARKS)**

(a) Highlight THREE types of costs in Inventory control

(9marks)

(b) Derive expression for the *Economic Order Quantity*,  $Q = \sqrt{\frac{2PD}{HC}}$  where there is no reserve stock and

$P$  = Preparation or set up cost;  $D$  = Annual production;  $H$  = Holding or Inventory carrying cost

$C$  = Unit cost of material;  $Q$  = Order quantity

(11 marks)

**QUESTION FOUR (20 MARKS)**

(a) Construct the network for a Dam design given the following information in Table 1

(10 marks)

**Table 1**

ACTIVITY	IMMEDIATE PREDECESSOR
a	None
b	a
c	b
d	b
e	a
f	e
g	c, d
h	f
i	g, f
j	i
k	j
l	j
m	j
n	k
o	l
p	m
q	g, h
r	n, o, p, q

s	q
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(b) A maintenance team of TWO Technologists can repair Four Solar Pannels per day, where a day constitute 8 hours. Determine the probability that the service will be completed in Four hours. Take the service time distribution to be exponential.

(10 marks)

**QUESTION FIVE (20 MARKS)**

A computer system can operate in two different modes. It remains in the same mode for an hour. It switches to a different mode in the next hour according to the transition probability matrix ,P where

$$P = \begin{bmatrix} 0.4 & 0.6 \\ 0.6 & 0.4 \end{bmatrix}$$

- (i) Determine the Two-step transition matrix
- (ii) Determine the probability matrix that the system will be in Mode I at 11.30 am, if it was in mode I at 8.30am

( 20 marks)