

CHUKA



UNIVERSITY

## UNIVERSITY EXAMINATIONS THARAKA CAMPUS

**EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF COMMERCE**

**BCOM 263: OPERATION RESEARCH**

**STREAMS: BED(ARTS)**

**TIME: 2 HOURS**

**DAY/DATE: THURSDAY 06/12/2018**

**8.30 A.M – 10.30A.M**

### INSTRUCTIONS

- Answer question one and any other two questions

1. (a) Discuss the development of OR giving reasons for its growth. [5 marks]
- (b) What are the assumptions of a transportation model. [3 marks]
- (c) Clearly explain what you understand by each of the following terms;
  - (i) Critical activity
  - (ii) Shadow cost
  - (iii) Feasible region
  - (iv) Optimum solution [4 marks]
- (d) You are provided with the following information on the transportation costs per unit from each source to each destination and the availabilities and the demand.

Source	X	Y	Z	Capacity
P	5	8	2	200
Q	12	6	5	480
R	9	10	4	320
Demand	400	250	350	

### Required:

- (i) Initial transportation schedule using Vogel's approximation technique and compute the minimum cost for your allocation. [6 marks]
- (ii) Evaluation whether the allocation in (i) above is optimal. [5 marks]

(e) Assume that company X ltd uses 50,000 kg of raw materials annually , its ordering costs are ksh 160 per order and stock holding costs are ksh 0.25 per kg p.a, purchase price is ksh 20 per kg and no quantity discount are offered, its load time for delivery of order is 4 weeks and working time is 50 weeks in a year.

Required:

- (i) Calculate the economic order quantity [2 marks]
- (ii) Calculate the inventory re-order level. [2 marks]
- (iii) Calculate the total cost per year. [3 marks]

2. (a) Explain the following terms:

- (i) Dummy activity [2 marks]
- (ii) Float [2 marks]
- (iii) Slack [2 marks]

(b) The following are activities of a project XYZ.

Activity	Preceding activity	Duration
A	-	2
B	A	3
C	A	5
D	A	8
E	B	6
F	C	1
G	C	2
H	C&D	3
I	E&F	7
J	G&H	4
K	I&J	5

Required :

Draw a network diagram determine the critical path and project duration. [14 marks]

3. (a) Using suitable examples distinguish between a single phase and multiple phase quality system. [8 marks]

(b) In a certain bank the mean arrival rate is one customer every 4 minutes and the mean service time  $2 \frac{1}{2}$  minutes.

Required :

- (i) Calculate the average number of customers in the system. [3 marks]
- (ii) The average time a customer spends in the system. [3 marks]
- (iii) The average queue length [3 marks]
- (iv) The average time a customer waits before being served. [3 marks]

4. (a) Discuss the steps in using the Hungarian method in solving assignment problems. [10 marks]

(b) Given below are the costs in thousands shillings for the hiring technicians to various jobs schedule.

Technician	Job type		
	electrical	mechanical	electronic
A	15	6	9
B	10	19	14
C	13	10	16

Required :

Advise the management on how to make the assignments in order to minimize costs and the minimum cost. [10 marks]

5. (a) Define the following terms clearly showing the examples.

- (i) Objective function [3 marks]
- (ii) Constraints [3 marks]
- (iii) Maximizing problems [3 marks]

(b) A manufacturing plant makes two types of boats a two person boat and a four person boat. These are made in two departments, outings department and assembly department. You are provided with the following information on hours required per boat and profit.

Types of boat	Departments		
	Outing	Assembly	profit
Two –person	0.9 hours	0.8 hours	ksh 250
Four –person	1.8 hours	1.2 hours	ksh 475
Maximum available hrs	864	672	

**Required:**

- (i) Formulate this as a linear programming problem. [5 marks]  
(ii) Solve the problem using the graphical method. [6 marks]
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