CHUKA **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE

MATH 445: OPERATIONS RESEARCH II

STREAMS: BSC MATHEMATICS   **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 29/09/2021   **8.30 A.M – 10.30 A.M.**

INSTRUCTIONS:
- **Answer question 1 and any other TWO.**

QUESTION 1 (30 MARKS)

(a)   Define the following terms as used in operation research
  (i)   A project   (2 marks)
  (ii)   Dummy activities   (2 marks)
  (iii)   Dykstra's algorithm   (2 marks)
  (iv)   Floyd's algorithm   (2 marks)

(b)   State three advantages of Network analysis and three advantages of Dykstra's algorithm.
                                                            (6 marks)

(c)   Draw the network diagram for the following activities

  Activity   Preceeding Activities
  A   -
  B   -
  C   A
  D   A
  E   B
  F   B
  G   C E
  H   C,E,F
                                                            (4 marks)

(d)   State five roles of floats in Network analysis   (10 marks)

(e) The table below shows six units of capital to invest in four business ventures under Dynamic programming. Find how the capital should be allocated to business proposal in order to maximize profit using one stage problem.

Unit	Expected returns	from business	proposals	
	A	B	C	D
0	0	0	0	0
1	5	2	6	2
2	6	4	7	2
3	7	6	8	4
4	8	8	8	5
5	8	9	8	6
6	8	10	8	6

(2 marks)

QUESTION 2 (20 MARKS)

(a) Given the following flow diagram, use Floyd's algorithm to find the shortest path between all pairs of Vertices.

(b) State four disadvantages of Dykstra's algorithm.   (4 marks)

QUESTION 3 (20 MARKS)

(a) The diagram below shows distances between 5 different places. Use Dykstra's algorithm to find the shortest distance between A and E.   (16 marks)

(b) State four disadvantages of Network analysis problem   (4 marks)

QUESTION 4 (20 MARKS)

The table given below shows activities and duration in weeks. Obtain

(i)   Mean activity time   (2 marks)

(ii)   The critical path   (10 marks)

(iii)   The standard deviation for the critical activities.   (8 marks)

Duration weeks

Activity	Preceded by	a	b	c	te
A	-	1	3	2	
B	-	2	8	2	
C	A	1	3	2	
D	B	1	11	15	
E	B	0.5	7.5	1	
F	C,D	1	7	2.5	
G	C,D	1	3	2	
H	E	6	8	7	
I	E	3	11	4	
J	FH	4	8	6	

QUESTION 5 (20 MARKS)

Use the following data to

(i)   Draw the network and determine the critical path.   (8 marks)

(ii)   Determine the earliest start, earliest finish latest start, latest finish, total float and free float times.   (12 marks)

Activity	Duration(weeks)
1 – 2	2
1 – 3	4
1 – 4	3
2 – 5	1
3 – 5	6
4 – 6	5
5 – 6	7