(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

SEMESTER EXAMINATIONS

FOR THE DEGREE
OF
MSc IN INDUSTRIAL ENGINEERING & MANAGEMENT

COURSE CODE: IEM 833E

COURSE TITLE: PLANT DESIGN AND MAINTENANCE

DATE: 26-04-2022 **TIME: 12:00-14:00**

INSTRUCTIONS TO CANDIDATES

This paper contains five questions
Answer THREE (3) questions

TIME: 3 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 2 Printed Pages. Please Turn Over.

Question ONE

A plant technical manager is scheduling to produce a new product with the following characteristics:

Task	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*
Optimitic time (t_o)	4	5	8	2	4	6	8	5	3	5	6
Pessimistic time (t_p)	8	10	12	7	10	15	16	9	7	11	13
Most likely time	5	7	11	3	7	9	12	6	5	8	9

a) Compute expected time of each task (3 Marks)

b) Compute the variance of each event (3 Marks)

c) Compute float time of each task (4 marks)

d) Construct possible PERT network for the new product (6 marks)

e) Indicate the new product critical path (4 Marks)

Question Two

Assuming you are employed as a technical manager in a given new plant:

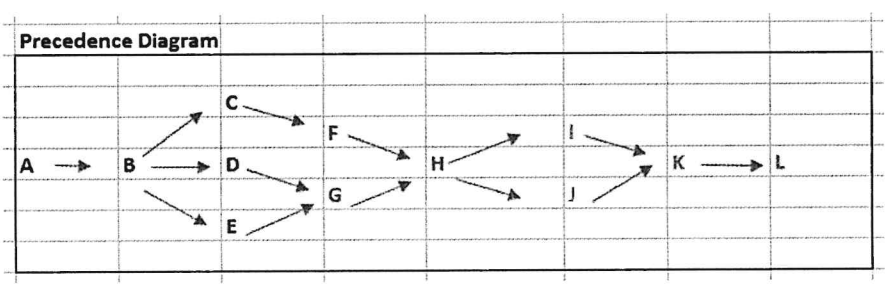
a) Explain how you would come up with a feasible engineering design (10 Marks)

b) With an aid of a sketch explain how you would address customers' needs in the new plant (10 marks)

Question THREE

The plant's manager target is to produce 500 units per day within an 8-hour shift. Given the following tasks, tasks' time and precedence time:

Task	Task Time (Seconds)
A	15
B	23
C	17
D	42
E	15
F	37
G	5
H	12
I	34
J	27
K	18
L	7
Total Time	252



a) Compute Takt time (3 Marks)

b) Compute number of stations (3 Marks)

c) Complete initial task table with precedence column (6 Marks)

d) Construct Task assignment table (8 Marks)

Question FOUR

Discuss with examples the application of Computerized Relative Allocation of Facilities Technique (CRAFT) in plant design (20 marks)

Question FIVE

In relation to plant preventive maintenance (PM) concept:

a) Discuss important engineering PM measures describing engineering equations of each measure (9 Marks)

b) Explain the process of developing a PM programme (8 Marks)

c) An engineering facility was observed over a period of time and the following data was obtained: $T_b = 0.1$ month, $T_i = 0.05$ month, $c = 3$. Calculate the optimal number of inspections per month (3 Marks)