The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Mechanical Engineering

Study Programme	:	Bachelor of Science Honours in Engineering
Name of the Examination	:	Final Examination
Course Code and Title	:	**DMX 6301 Industrial Engineering**
Academic Year	:	2023-2024
Date	:	28 February 2025
Time	:	1400-1700 hrs
Duration	:	3 hours

General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of 05 questions. All questions carry equal marks.
3. **Answer all 05 questions.**
4. Use the table attached at the end of the question paper to **answer Q3.**

Q1.

(a) What are the areas that should be analyzed before formulating the corporate strategy of an organization? (4 Marks)

(b) Differentiate between the terms "manufacturing strategy" and "corporate strategy" as applicable to a production organization of your choice. (6 Marks)

(c) What is PESTEL analysis? (4 Marks)

(d) Explain PESTEL analysis emphasizing the importance of analyzing each factor in strategic decision making in a manufacturing organization. (6 Marks)

Q2.

(a) Work study is beneficial for workers as well as the management. Explain how it is beneficial for workers? (6 Marks)

(b) List down the main steps of a method study. (6 Marks)

(c) Give two examples each for "productive activities" and "non-productive activities" in a factory of producing garments, you may identify during a work study. (4 Marks)

(d) What are the actions you may take as the work study manager, for reducing non-productive activities? (4 Marks)

Q3.

(a) What are the main objectives of a MRP system? (3 Marks)

(b) Mention at least three possible causes for failure of ERP systems. (3 Marks)

(c) Product X is made of three (3) units of Y and Two (2) units of Z. Y is made of four (4) units of A and two (2) units of B. Z is made of two (2) units of A and three (3) units of C.

Lead time as given below table Q3-1

Table Q3-1

Product	X	Y	Z	A	B	C
Lead Time (Weeks)	1	2	1	2	1	1

(i) Draw the Product structure tree (BOM) (4 Marks)

(ii) If 100 units of X are needed in week ten (10), develop a Material Requirement Plan

a) When there are currently no on hand stock (5 Marks)

b) When there are currently on hand stock 100X, 50Y, 30Z, 50A,100B and 400C. (5 Marks)

(Use the MRP sheets attached at the end of the question paper to answer Q3 (c)-ii)

Q4.

(a) How do you find the observed time in a time study? Explain. (4 Marks)

(b) What are the allowances you may consider when calculating the standard time for a machine operator in a garment factory? (6 Marks)

(c) The Table Q4-1 below are the observed times obtained by the stopwatch method during 10 Observations of a single element of a manual task.

Table Q4-1

Observation Number (N)	Observed time for element (in 1/100 min)
1	44
2	40
3	43
4	42
5	40
6	45
7	40
8	48
9	40
10	42

i. Find the observed time for this element of work. (3 Marks)

ii. What is the basic time if a rating factor for a skilled level is +0.11? (3 Marks)

iii. Calculate the standard time of the job if the personal allowance is considered as 7 %. (4 Marks)

Q5.

(a) Explain the advantage of using linear programming techniques in decision making. (6 Marks)

(b) A manufacturer produces two types of parts: Type A and Type B. The available resources, amount of material needed for a unit, maximum possible amount of resources and the profit from one unit of products are given in the Table Q5- 1, below.

Table Q5-1

Resources	Amount needed for a unit		Maximum amount of resources available
	Type A	Type B	
Q	2	1	20
R	1	2	20
S	1	1	10
Profit per unit (Rs)	3	2	

(i) Determine and define the decision variables. (2 Marks)

(ii) Formulate the objective function. (3 Marks)

(iii) Formulate each constraint. (5 Marks)

(iv) Find the number of Type A and Type B items manufactured to maximize the profit. (4 Marks)

3) (c) ii - (a) when there are currently no on hand stock

		Week									
Item		1	2	3	4	5	6	7	8	9	10
X	Gross Requirement										
(LT=1)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										
Y	Gross Requirement										
(LT=2)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										
Z	Gross Requirement										
(LT=1)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										
A	Gross Requirement										
(LT=2)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										
B	Gross Requirement										
(LT=1)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										
C	Gross Requirement										
(LT=1)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										

(3) (c) ii - (b) when there are currently on hand stock 100X, 50Y, 30Z, 50A,100B and 400C

		Week									
Item		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
X	Gross Requirement										
(LT=1)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										
Y	Gross Requirement										
(LT=2)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										
Z	Gross Requirement										
(LT=1)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										
A	Gross Requirement										
(LT=2)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										
B	Gross Requirement										
(LT=1)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										
C	Gross Requirement										
(LT=1)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										

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