

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 : 2024-2025
Date : 21 February 2026
Time : 1330-1630 hrs
Duration : 3 hours

General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **05 questions**, in **05 pages**. 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) Social responsibility is a major factor that should be analyzed before formulating the corporate strategy of an organization. Discuss at least two factors concerned with this analysis. (4 Marks)
- (b) Differentiate the terms "manufacturing strategy" and "corporate strategy" (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 an organization involved new technology and innovation. (6 Marks)

Q2.

- (a) Define "Work Study" (4 Marks)
- (b) Explain how Work study contributes to cost reduction in manufacturing organizations. (3 Marks)
- (c) Describe in detail the steps involved in Method Study, explaining the purpose of each step. (4 Marks)
- (d) How do you define "productive" and "nonproductive" activities? (4 Marks)
- (e) What are the actions you may take as the work study manager, for reducing non-productive activities? (3 Marks)

Q3.

- (a) What are the three basic inputs to an MRP system?? (3 Marks)
- (b) Discuss the benefits and challenges of ERP implementation in manufacturing organizations. (4 Marks)
- (c) Product X is made of three (3) units of Y and Two (2) units of Z. Y is made of two (2) units of A, and three (3) 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	2

- (i) Draw the Product structure tree (BOM) (3 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) Briefly explain the difference between observed time and the standard time in a time study. (4 Marks)
- (b) What are the allowances you may consider when calculating the standard time for a lathe machine operator? (6 Marks)
- (c) Table Q4-1 shows the observed times obtained using the continuous stopwatch method during 12 observations of a single element of a manual operation.

Table Q4-1

Observation Number (N)	Observed time for element (in 1/100 min)
1	38
2	42
3	40
4	41
5	39
6	43
7	40
8	44
9	39
10	41
11	40
12	42

- i. Calculate the average observed time for the work element. (3 Marks)
- ii. Determine the basic time if the worker's performance rating is 110% (+0.1) (3 Marks)
- iii. Calculate the standard time of the job if the personal allowance is considered as 6 %. (4 Marks)

Q5.

- (a) Explain the advantage of using linear programming techniques in decision making in industrial management? (4 Marks)
- (b) A factory manufactures two products: Product P and Product Q. Each product requires processing time on three resources: Machine M1, Machine M2, and Machine M3. The resource requirements, availability, and profit per unit are given in Table Q5-1.

Table Q5-1

Resources	Amount processing hrs needed for a unit		Maximum number of hrs resources available
	Product P	Product Q	
M1	1	3	24
M2	2	1	20
M3	1	1	12
Profit per unit (Rs)	3	4	

- (i) Define the decision variables clearly. (2 Marks)
- (ii) Formulate the objective function. (3 Marks)
- (iii) Formulate all constraints of the problem. (5 Marks)
- (iv) Determine the optimal production quantities of Product P and Product Q that maximize total profit. (4 Marks)
- (v) State the maximum profit obtainable. (2 Marks)

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

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

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

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