

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



Study Programme	: BTech Hons in Engineering
Name of the Examination	: Final Examination
Course Code and Title	: DMX 6540 Industrial Engineering
Academic Year	: 2020-2021
Date	: 06 February 2022
Time	: 0930-1230 hrs
Duration	: 3 hours

General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of 07 questions. All questions carry equal marks.
3. Answer any 05 questions only.
4. Use the table attached at the end of the question paper to answer Q3.

Q1. A project has activities from A to J as shown in the table given below. The Preceding activities, Normal duration of each activities are given in the table 1-1

Table 1-1

Activity	Preceding Activity	Duration(days)
A	-	8
B	A	12
C	A	16
D	A	20
E	C	8
F	B,C	24
G	B	16
H	F,G	20
J	D,E,F	12
K	J,H	8

- (a) Why scheduling techniques are important in project management? (3 Marks)
- (b) Draw the network diagram for the data given in the table 1-1. (6 Marks)
- (c) Find Latest Start time (LST) and Earliest Finishing time(EFT) of each activity. (5 Marks)
- (d) Find the Critical Path of the Project. (2 Marks)
- (e) Find the project duration. (2 Marks)
- (f) What is the activity with the highest float? (2 Marks)

- Q2.
- (a) What is the purpose of work study? (3 Marks)
 - (b) How does the management of an organization benefit from work study? (3 Marks)
 - (c) What are the factors that must be considered when selecting a job for method study? Explain main three factors. (6 Marks)
 - (d) What are the recording techniques used in method study? Name two of them. (2 Marks)
 - (e) What is the basic procedure of method study? List down main steps. (6 Marks)

- Q3. (a) What are the benefits of MRP? (3 Marks)
- (b) What are the elements of the MRP? (3 Marks)
- (c) Product X is made of two units of Y and three units of Z. Y is made of three units of A and two units of B. Z is made of two units of A and two units of C.

Lead time as given below:

Table 3-1

Product	X	Y	Z	A	B	C
Lead Time(Weeks)	1	2	2	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 in stock (5 Marks)
- b) when there are currently on hand in stock 20X, 40Y, 30Z, 50A, 100B and 400C. (5 Marks)

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

- Q4. (a). What is the key principle of lean operations? (2 Marks)
- (b) Give reasons why you introduce lean manufacturing for an organization. (3 Marks)
- (c) What are the eight waste in a lean manufacturing system?. (4 Marks)
- (d) Define the term Just in Time (JIT)? (3 Marks)
- (e) What are the main differences between Traditional approach and JIT approach. (5 Marks)
- (f) What is Kanban? If you introduce Kanban for your organization what are the benefits you can expect? (3 Marks)

- Q5. (a) Transportation problems can be solved using different methods. Name three of them. (3 Marks)
- (b) There are 03 garment factories located at A, B and C and three distribution centers at Kaluthara, Colombo and Gampaha. Supply from 03 factories are 6000, 9000 and 5000 units respectively and the demand in 03 distribution centres are 5000, 8000 and 7000 units respectively. Transportation cost distribution is given below table 5-1 in Rs.(000's)

Table 5-1

Location	Kaluthara	Colombo	Gampaha
A	10	8	12
B	12	13	10
C	8	10	14

- (i) Is this an unbalanced transportation problem? If not why? (3 Marks)
- (ii) Find the transportation schedule using the least cost method. (7 Marks)
- (iii) Find the optimum transportation schedule. (4 Marks)
- (iv) What is the total minimum transportation cost? (3 Marks)

- Q6. (a) What is the purpose of using linear programming techniques in decision making? (3 Marks)
- (b) What are the limitations of graphical method? (3 Marks)
- (c) A Tile manufacture makes two types of tiles type A and Type B. The available resources, amount of clay needed for a one-unit, maximum possible amount of resources and the profit from one unit of products are given in the Table 6-1 below.

Table 6-1

Resources	Amount needed for a unit		Maximum amount of resources available
	Type A	Type B	
Clay (g)	100	250	25000
Labour (hrs)	2	1	300
Profit per unit (Rs)	80	60	

- (i) Determine and define the decision variables (2 Marks)
- (ii) Formulate the objective function (2 Marks)
- (iii) Formulate each constrains (4 marks)
- (iv) Find the number of Type A and Type B manufactured to maximize the profit. (6 marks)

- Q7. Write short notes on **any four** of the following; (5 Marks each)
- (a) The main role of the Industrial Engineer
- (b) Product life cycle and its importance.
- (c) Advantages and disadvantages of ERP systems.
- (d) The purpose of work measurement
- (e) Product Inventory Management
- (f) ERP life cycle

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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=2)	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										

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=2)	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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