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

Study Programme	:	Bachelor of Technology Hons in Engineering
Name of the Examination	:	Final Examination
Course Code and Title	:	**DMX 6540 /MEX6240 Industrial Engineering**
Academic Year	:	2019/20
Date	:	29.07.2020
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 and 06 pages.
3. **Answer any 05 questions only**. All questions carry equal marks.
4. Answer for each question should commence from a new page
5. Relevant charts/ equations are provided.
6. This is a Closed Book Test (CBT).
7. Answers should be in clear handwriting.
8. Do not use Red colour pen.

Q1. (a) What is the purpose of work study?

(b) What is the objective of the method study?

c) What is the basic procedure of method study?

d) What are the recording techniques used in method study?

e) Describe in brief one of those techniques mentioned in (d).

f) Describe multiple activity charts and their application?

[20 marks]

Q2. Write short notes on the following;

(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 [20 marks]

Q3. A project has activities from A to J as shown in the table 1 given below. The Preceding activities, Normal duration of each activity and Normal cost of each activity are also given.

Table1

Activity	Preceding Activity	Normal duration(days)	Normal cost (Rs)
A	-	3	200
B	-	4	500
C	-	3	500
D	A	5	600
E	B	5	400
F	B	7	600
G	C	4	700
H	G	6	400
I	D,E	6	300
J	I,F,H	9	500

(a) Why scheduling techniques are important in project management?

(b) What are the main differences of PERT and CPM?

(c) Draw the network diagram using Activity On Arrow (AOA) method for the data given in the table 1.

(d) Find the Critical Path of the Project.

(e) Find the project duration.

(f) Find Latest Start time (LST) and Earliest Finishing time (EFT) of each activity.

(g) What are the activities which can be delayed without affecting project duration?

(h) Which activity can be delayed most?

(i) If indirect cost of the project is Rs.500 per day, what is the total cost of the project?

[20 marks]

Q4. (a) What is the objective of MRP?

(b) What are the benefits of MRP?

(c) What are the elements of MRP?

(d) Determine optimum order released quantity schedule and total cost for a sub assembly if inventory holding cost is Rs 2/unit/period and setting up cost is Rs 400/order using fixed quantity batching rule.

Assume lead time is 2 weeks, and net requirement plan is given as follows;

Week No	11	12	13	14	15	16	17	18
Net Requirement	50	80	40	90	0	60	120	80

(e) Product X is made of two units of Y and three units of Z. Y is made of two units of A and two units of B.Z is made of two units of A and three units of C.

Lead times are given below:

Product	X	Y	Z	A	B	C
Lead Time (Weeks)	1	2	4	2	1	3

(i) Draw the Product structure tree (BOM)

(ii) If 100 units of X are needed in week ten (10), develop a Material Requirement Plan when there are currently on hand in stock 20X, 40Y, 30Z, 50A,100B and 400C.

(Use the MRP sheets attached at the end of the question paper to answer Q4)

[20 marks]

Q5.

a) What is the key principle of lean operations?

b) Give reasons why you introduce lean manufacturing for an organization.

c) What are the eight wastes in a lean manufacturing system?

d) Define the term JIT and TPS?

e) Describe in brief JIT approach.

f) Why Kanban is important for your organization? What are the benefits of Kanban?

[20 marks]

Q6. A) What are the methods that you can use to solve Transportation problems?

The BINS Concrete Company has plants in three locations and is currently working on three major construction projects, each located at a different site. The shipping cost per truckload of concrete in Rs(000's), daily plant capacities (Ton's), and daily demand (Ton's) are provided in the accompanying table.

a) formulate an initial feasible solution to BINS transportation problem using least cost method.
b) solve it using the MODI method.
c) Was the initial solution optimal?

Location	Project A	Project B	Project C	Plant Capacities
Plant P	10	4	11	70
Plant Q	12	5	8	50
Plant R	9	7	6	30
Project Demand	40	50	60	150

Q7. (a) For what purpose linear programming tool is sued?

(b) What are the basic elements of a linear programming model?

(c) What is the importance of Linear programming?

(d) What are the limitations of graphical method?

(e) A fruit grower has 150 acres of land available to grow two crops, A and B. It takes one day to trim an acre of crop A and two days to trim an acre of crop B and there are 240 days per year available for trimming. It takes 0.3 day to pluck an acre of crop A and 0.1 day to pluck an acre of crop B and there are 30days per year available for plucking fruits. Find the number of acres of each fruit that should be planted to maximize profit, assuming that the profit is Rs140,000 per acre for crop A and Rs235,000 per acre for B.

(i) Determine and define the decision variables

(ii) Formulate the objective function

(iii) Formulate constrains

(iv) Find the number of acres to grow crop A and number of acres to grow crop B to maximize the profit using any linear programing method you are familiar.

[20 marks]

		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=4)	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=3)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										