The Open University of Sri Lanka
Faculty of Engineering Technology

Study Programme	:	Bachelor of Technology Honours in Engineering
Name of the Examination	:	Final Examination
Course Code and Title	:	**MEX6240 Industrial Engineering**
Academic Year	:	2016/17
Date	:	04.12.2017
Time	:	0930-1230 hrs
Duration	:	3 hours

General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of 08 questions. All questions carry equal marks.
3. Answer any 05 questions only.

Q1. a) Distinguish Industrial Engineering from other disciplines of Engineering.[04 marks]

b) If an organization decided to get the service of an Industrial Engineer what factors may have influenced this decision? [04 marks]

c) If you have appointed as the Industrial Engineer of this organization what is the role that you have to play to prove this decision is right? [04 marks]

d) Name five techniques used in Industrial Engineering. [04 marks]

e) Industrial Engineer designs systems at two levels. What are they? Describe them in detail. [04 marks]

Q2. a) What is the main purpose of production planning? [02 marks]

b) List the four main production planning activities. [02 marks]

c) What are the types of inventories? [03 marks]

d) Explain the reasons for maintaining Inventories in an Organization. [03 marks]

e) What are the disadvantages of Inventories? [02 marks]

f) What are the inventory related costs? [02 marks]

g) The demand of a product is 9600 units per year and the item is used continuously at constant rate. The price of the item is Rs.50 per unit. The ordering cost is estimated as Rs 800 per order. The inventory holding cost is Rs 8 per unit per month. Lead time is one week.

Find:

(i) EOQ

(ii) Reorder Level

$EOQ = [\ 2C_p\ D/C_h\ ]^{1/2}$ where C_p is the Ordering cost per order and Ch is the Holding cost per unit per month.

Reorder Level = DL where D is the demand in no of units per year and L is lead time in years. [06 marks]

Q3. (a) Name two scheduling techniques used in production planning. [01 mark]

(b) Differentiate between CPM and PERT. [01 mark]

(c) Compare CPM with any other scheduling technique. [01 mark]

A project has activities from A to I. The Preceding activities, Normal duration, Crash duration, Normal cost and Crash cost for each activity also is given.

Activity	Preceding Activity	Normal duration(days)	Crash duration(days)	Normal cost (Rs) (per day)	Crash cost(Rs) (per day)
A	-	6	4	500	900
B	-	4	4	400	600
C	A	5	4	600	800
D	B	3	3	700	1000
E	B,C	6	4	800	1400
F	C,D	7	6	900	1400
G	E,F	4	3	1000	1600
H	C, D	11	9	1000	1200
I	G,H	3	2	1200	2000

(d) Draw the Activity On Arrow (AOA) diagram using the data given in the table above. [05 marks]

(e) Find the Critical Path of the Project [01 mark]

(f) Find the project duration. [01 mark]

(g) Find Earliest Start time (EST) and Latest Starting time(LST) of each activity.

[02 marks]

(h) How many days can be delayed activities of B, D and H without affecting project completion time? [02 marks]

(i) What is the total cost of the project if it is competed in normal duration? [02 marks]

(j) If project is completed in 21 days, what is the total cost of the project? [04 marks]

Q4. a) Net requirement of an item produced in a manufacturing process during 10 weeks are given in the Table below;

Week No.	1	2	3	4	5	6	7	8	9	10
Net Requirement	0	400	200	0	400	0	400	200	200	300

If the setup cost is Rs 1000 and the holding cost is Rs 0.9 per item per week, find the Economic Order Quantity (EOQ). [02marks]

$EOQ = [\ 2AS/H]^{1/2}$

A- Average demand
H- Holding cost
S- Setup cost

b) Fill the Table below with the appropriate batch size using the fixed period batching rule, if the lead time is one week. [02 marks]

Week No.	1	2	3	4	5	6	7	8	9	10
Net Requirement	0	400	200	0	400	0	400	200	200	300
Batch requirement										
Planned order Starts										

c) What are the benefits of MRP? [02 marks]

Product X is made of three units of Y and two units of Z. Y is made of two units of A and one unit of B. Z is made of two units of B and three units of C. Lead time for X is one week, Y is two weeks, Z is three weeks, A is one week, B is two weeks and C is three weeks.

d) Draw the Product structure tree. [04 marks]

e) If 100 units of X are needed in week ten (10), develop a Material Requirement Plan
   (i) when there are currently zero on hand.
   (ii) when there are currently on hand 20X, 30Y, 40Z, 50A,100B and 600C.

(Use the MRP sheets attached at the end to answer this question) [10 marks]

Q5. Write short nots on the following:

a) Product life cycle [04 marks]
b) Lean manufacturing [04 marks]
c) Kanban [04 marks]
d) Supply chain management [04 marks]
e) Push and Pull system [04 marks]

Q6. a) What are the methods known to you that you can use to solve transportation problems? [02 marks]

b) The Tokyo Cement Company has three plants in three different locations and is currently working on three major construction sites, each located at a different site. The transportation cost per truckload of concrete, daily plant capacities, and daily project requirements are provided in the table given below.

	Project A	Project B	Project C	Plant Capacities
Plant P	$10	$4	$11	700
Plant Q	$12	$5	$8	500
Plant R	$9	$7	$6	300
Project demands	400	500	600	1500

(i) Find the total transportation cost using North West Corner rule. [04 marks]
(ii) Find the transportation cost using the least cost method. [04 marks]
(iii) Use MODI method to find the optimum transportation cost. [06 marks]
(iv) What is the minimum transportation cost? [04 marks]

Q7.(a) How do you formulate a linear programming model for a given problem? [01 mark]

(b) Describe basic elements of a linear programming model. [01 mark]

(c) Give any practical application of Linear Programming. (LP) [01 mark]

(d) Why graphical method cannot be used in all kind of LP models? [01 mark]

(e) A Computer Assembler plans to sell two models of computers at costs of $250 and $400, respectively. The $250 model makes a profit of $45 and the $400 model makes a profit of $50. The Computer assembler predicts that the total monthly demand of computers will not exceed 250 units. Find the number of units of each model that should be assembled and stored in order to maximize the profit. Assume that the Computer assembler does not want to invest more than $70,000 in computer inventory.

(i) Determine and define the decision variables [02 marks]

(ii) Formulate the objective function [02 marks]

(iii) Formulate each constrains [02 marks]

(iv) Find the number of each model of computers assembled to maximize the profit using the simplex method. [08 marks]

(v) Find the maximum profit. [02 marks]

Q8 a) You have been appointed as an Industrial Engineer of a well reputed company. If your first task is to apply TPS for this organization:

(i) Will you recommend TPS for this company?

(ii) If so why? Give reasons.

(iii) Describe what factors you will take into consideration before applying TPS and then the entire procedure in detail. [06 marks]

b) If your company operates business worldwide what will be your next recommendation? [02 marks]

c) Justify your recommendation with facts and explain your recommended system in detail. [04 marks]

d) What are the obstacles you come across when you implement this new system? [04 marks]

e) What are the new benefits you wish to achieve by implementing this new system? [04 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=3)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										
A	Gross Requirement										
(LT=1)	On Hand ( )										
	Net Requirement										
	Planned Order receipts										
	Planned Order release										
B	Gross Requirement										
(LT=2)	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										

		Week									
Item		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
X	Gross Requirement										
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	Net Requirement										
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