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THE OPEN UNIVERSITY OF SRI LANKA

FACULTY OF ENGINEERING TECHNOLOGY

BACHELOR OF TECHNOLOGY – LEVEL 06

FINAL EXAMINATION – 2011/12

MEX6340 – INDUSTRIAL ENGINEERING

DATE : March 09, 2012
TIME : 0930 HRS. – 1230 HRS.
DURATION : THREE HOURS

ANSWER ANY FIVE (05) QUESTIONS. *ALL QUESTIONS CARRY EQUAL MARKS.*

Question 1

1. Define **method design** in the context of Method Study.

2. Briefly describe the eight system-elements used in method design.

3. Briefly discuss the techniques used in 'gathering and analyzing information' in method study exercise.

4. Motion photography is commonly used technique in modern method study. Write a short note on 'data acquisition' in this technique.

Question 2

Ceylon Sports PLC manufactures baseball bats and rugby balls. Each baseball bat yields an incremental profit of Rs. 200/- and each rugby ball Rs.400/-. A baseball bat requires 4 hours of processing at the machine center ***A*** and 2 hours at the machine center ***B***. A rugby ball requires 6 hours at the machine center ***A***, 6 hours at the machine center ***B*** and 1 hour at the machine center ***C***. Machine center ***A*** has a maximum of 120 hours of available capacity per day, Machine center ***B*** has 72 hours and machine center ***C*** has 10 hours.

a. Formulate the production problem in mathematical terms.

b. Determine the area of feasibility.

c. If the company wishes to maximize profit, how many baseball bats and rugby balls should be produced per day?

Question 3

A production system has six different manufacturing departments ***A***, ***B***, ***C***, ***D***, ***E*** and ***F***, each having a shop floor with a square area of 100 m^2. It is necessary to design a plant layout by organizing them within a rectangular building having a floor area of 20 *m* X 30 *m*. Following travel chart (Table.Q3) shows the movement of items during a period of one week.

To / From	***A***	***B***	***C***	***D***	***E***	***F***
A	-	35	60	90	50	140
B	40	-	75	150	25	15
C	90	40	-	100	10	60
D	40	60	15	-	60	140
E	110	250	20	90	-	95
F	100	95	85	160	240	-

Table.Q3

Following additional information are given as constrains:
The departments ***C*** and ***D*** always use a common facility. The departments ***A*** and ***B*** should be kept as close as possible for supervision. The department ***A*** and ***F*** are required to be kept far apart due to safety reasons.

Using the method of Systematic Layout Planning (SLP),

a. Using AEIOUX grouping, construct activity relationship chart.

b. Draw the initial relationship diagramme and the final layout based on relationship diagramme subject to the constraints.

Question 4

1. Write a brief introduction on **Ergonomics** explaining why it is important, and how it enables improving productivity.

2. Taking appropriate measurements is an essential requirement to manage any manufacturing process, and normally the important measurements are displayed on the factory flow. Name different such measurements and explain the reasons for taking these measurements.

3. 'Quality is not just about logos, it should mainly focus on reducing operational costs and improving profits'. Comment on this statement.

4. Quoting appropriate example of application, explain the principles behind **Pareto Analysis** and **Cause and Effect diagrams**.

Question 5

1. Define **Critical Path** and **Dummy Activity** in network analysis.

2. A construction company wishes to construct a pilot plant for their client, the Municipal Council, for the treatment of domestic waste. The activities for this project are shown in the Table.Q5.

	Activity	Duration/ weeks	Activity Immediately Preceding
A	Equipment delivery	6	None
B	Site preparation	10	None
C	Development of control system	14	A
D	Equipment assembly	8	A
E	Underground connections	6	B
F	Process connections	18	B
G	Training of operating team	10	C
H	Delivery and preparation of raw materials	12	F
I	Installation and equipment checkout	6	D,E

Table.Q5

a. Draw a project network.

b. Find the earliest and latest start and finished dates for activities.

c. What is the minimum time to complete the project?

d. What is critical path?

e. How can several activities be managed, if personnel are limited?

Question 6

Information required for preparation of the activity diagram of a construction project is given in the following Table.Q6.

a) Draw the network diagram for the project.

b) Determine the critical path and project completion time.

Activity	Preceding Activity	Duration/ days	Possible crash/ days
a	-	5	2
b	-	3	1
c	-	4	1
d	a	3	-
e	b	2	-
f	b	4	1
g	c	2	-
h	f	3	1
i	f	2	-
j	e	2	-
k	d, i, j	2	-
l	h, g	3	1
m	k, l	4	1

Table: Q6

Question 7

1. Just-in-time (JIT) and Material Requirement Plan (MRP) are two different systems for controlling production. It is often said that,

   - MRP = a 'Push' system
   - JIT = a 'Pull' system

   Discuss.

2. What is Enterprise Resource Planning (ERP)? Briefly explain the key application modules that can be found in an ERP system.

3. What is Supply Chain Management? Describe five basic components of Supply Chain Management.

4. Describe the term 'Outsourcing' and explain why a firm would want to outsource.

Question 8

1. Briefly discuss **Planed Order Release** and **Scheduled Order Receipt** used in MRP.

2. Product ***M*** is made up of two subassemblies identified as ***N*** and ***P***, which are in turn made up of several subcomponents. Product ***M*** is made of 2 units of ***N*** and 3 units of ***P***. ***N*** is made of 2 units of ***R*** and 4 units of ***S***. ***R*** is made of 1 unit of ***S*** and 3 units of ***T***. ***P*** is made of 2 units of ***T*** and 4 units of ***U***.

    a. Prepare the Bill of Materials (product structure tree) for Product ***M***.

    b. Lead times and stock in hand of ***M***, ***N***, ***P***, ***R***, ***S***, ***T*** and ***U*** are given below in Table.Q8. If 100 units of ***M*** are required in week 10, develop a planning schedule showing what quantity of and when each item is ordered.

Item	Lead times (weeks)	Stock in hand
M	1	50
N	2	60
P	2	70
R	4	100
S	2	0
T	2	0
U	1	0

Table.Q8

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MRP Sheet for question no 08

Product	On Hand		1	2	3	4	5	6	7	8	9	10
		Gross Requirement On hand Net Requirement Planned order receipt Planned order release										
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