THE OPEN UNIVERSITY OF SRI LANKA

FACULTY OF ENGINEERING TECHNOLOGY

BACHELOR OF TECHNOLOGY – LEVEL 06

FINAL EXAMINATION – 2009/10

MEX6340 – INDUSTRIAL ENGINEERING

930

DATE : ***March 19, 2010***

TIME : ***0930 HRS. – 1230 HRS.***

DURATION : ***THREE HOURS***

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

Q.01. a. State what **linear programming** is? Also discuss the limitations of linear programming.

b. A Pharmaceutical Manufacturing company has a stock of 100*kg* of Thiamine Hydrochloride, 180*kg* of Nicotainamide and 120*kg* of Lactose Monohydrate in a given month. The company can use these active ingradiants to make three types of Vitamin B complex tablets, identified as V_B-5-10-5, V_B-5-5-10 and V_B-20-5-10, where the identification number of each tablet represents the percentage by weight of Thiamine Hydrochloride, Nicotainamide and Lactose Monohydrate respectively. In addition, an inert ingredient (binding powder) is used to maintain the compactness of tablets. The cost of the ingredients is given in the Table.Q1.

Ingredient	Cost per kg (Rs)
Thiamine Hydrochloride	800.00
Nicotainamide	200.00
Lactose Monohydrate	500.00
Binding powder	200.00

Table.Q1

Selling price of the Vitamin B tablets as listed earlier are Rs. 405.00, Rs. 430.00 and Rs. 450.00 per *kg* respectively. There is a restriction imposed by the management of the company for the product V_B-5-10-5, so that not more than 30*kg* of that particular vitamin can be produced in a month. Determine how much of each of the products they should produce in order to maximize the profit.

Q.02. a. Discuss how the **Planed order release** and **Scheduled order receipt** used in MRP.

b. A Product *M* is made up of two sub-assemblies 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*.

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

ii. Lead times and stocks in hand of *M*, *N*, *P*, *R*, *S*, *T* and *U* are given in Table.Q2. If 100 units of *M* are required in week 10, develop a planning schedule showing how much (what quantity) and when each item should be ordered.

Note: *Use the MRP sheet attached at the end of the question paper.*

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.Q2

Q.03. a. Write a brief introduction on **Ergonomics.** Your answer should clearly explain the importance and how proper ergonomic considerations can help to improve productivity.

b. Measurement is an essential requirement in managing a manufacturing process. Name the different types of measurements to be highlighted on display board on the factory floor.

c. 'Quality is not just about logos, it should mainly focus on reducing operational costs and improving profits'. Comment on this statement within the context of industrial engineering.

d. Explain the principles behind **Pareto Analysis** and **Cause and Effect Diagrams**, quoting an appropriate example for each topic.

Q.04. a. Elimination of waste is vital for any organization. Describe the seven prominent types of wastes defined by the **Toyota Production System.**

b. Taking an example of a manufacturing or service organization, identify the types of wastes the organization liberates and suggest possible methodology to eliminate them.

Q.05. a. What is **Enterprise Resource Planning** (ERP)? Briefly explain the key application modules that can be found in an ERP system.

b. Explain what **Supply Chain Management** is? Describe five basic components of Supply Chain Management.

c. Describe the term **Out Sourcing** and explain clearly why out sourcing is needed to an organization.

Q.06. a. What are the assumptions you make in **Transportation Algorithm** method?

b. A company decides to produce two new models of electrical equipment, model *XP* and model *XQ*. The company intends to earn a profit of Rs. 400.00 and Rs. 450.00 from the model *XP* and *XQ* respectively. The assembly time for the product *XP* is 12*hrs* and that for *XQ* is 10*hrs* and the testing time for *XP* is 5*hrs* and that for *XQ* is 7*hrs*. The manufacturing time is considered as the total time spent on assembling and testing. If the total assembly time available at the facility is 2,600*hrs* and the total testing time available is 1,100*hrs*, using **simplex method,** calculate the maximum possible profit which can be achieved by producing the two models.

Q.07. a. Suggest why would '**make to stock**' manufacturer wish to become '**make to order**' manufacturer? Your answer should clearly explain the latest trends in the society which attract the manufacturer to follow **making to order** mode?

b. What fundamental questions should any manufacturing organization attempt to answer, irrespective of its size, process or type of product?

c. Compare and contrast the **Production plan** with the **Business plan.**

Q.08. a. Define what is the **Critical Path** and a **Dummy activity** within the context of project network analysis.

b. A construction company wishes to construct pilot plant for their client, the Municipal council, for the treatment of domestic waste. The activities for this project are shown in Table.Q8.

	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.Q8

i. Draw a project network for the above mission.

ii. Find the earliest and latest start and finish dates for the activities.

iii. What is the minimum time needed to complete the project?

iv. State the critical path?

v. Explain how several activities can be managed, if the company has only limited personnel resources.

MRP sheet for Question No.2

roduct	On Hand		1	2	3	4	5	6	7	8	9	10	11
		Gross Requirement On hand Net Requirement Planned order receipt Planned order release											
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