THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
DIPLOMA IN TECHNOLGY-LEVEL 4
FINAL EXAMINATION -2006/2007
MEX4235- PRODUCTION MANAGEMENT -PART B

043

DATE : 04 APRIL 2007 (Wednesday)
TIME : 1015-1230
DURATION : 2 HOURS AND 15 MINUTES

Answer any five (05) questions. All questions carry equal marks.
Graph sheets will be provided at request.

QUESTION 1.

1.1 What is critical path and how important is it in project planning?

(04 marks)

1.2 The costs and time estimates of activities of a certain project are given in table Q_1.

Job	Immediate Predecessor (s)	Normal Time (Weeks)	Normal Cost (Rs.'000)	Crash Time (Weeks)	Crash Cost/Week (Rs.'000)
A	-	4	400	3	125
B	A	5	800	4	200
C	A	4	520	2	150
D	B	3	600	2	225
E	C	3	255	2	100
F	B, E	4	600	2	175

Table Q_1

1.2.1 Draw the project network, and find the critical path.

(06 marks)

1.2.2 Find the project completion time and the corresponding cost.

(04 marks)

1.2.3 What is the minimum total cost, if the project deadline is 13 days? Show your computations clearly.

(06 marks)

QUESTION 2.

2.1 State fully Johnson's Algorithm for sequencing jobs on two machines, explaining clearly the conditions under which it can be applied.

(05 marks)

2.2 Five jobs A, B, C, D and E are to be processed on a processor which has two sequential stages. Time in hours required by each job at each stage is as shown in table Q_2.

Job	Processing Stage	
	I	II
A	5	10
B	7	2
C	10	5
D	8	6
E	3	5

Table Q_2

2.2.1 Determine the processing order which minimises the total time required to process all jobs.

(05 marks)

2.2.2 Construct a complete Gantt chart.

(04 marks)

2.2.3 Comment on the total idle time in your schedule.

(02 marks)

2.3 Briefly describe the limitation of the above analytical solution in comparison with real world situation.

(04 marks)

QUESTION 3.

3.1 Why is an inventory system important for any manufacturing organisation?

(04 marks)

3.2 Describe the major cost categories used in inventory analysis and their functional relationship to each other.

(02 marks)

3.3 Over the course of each year the Krispy Crisps Company Limited purchases a large number of wooden pallets for use in the storage and transportation of its products to replace those lost or damaged in transit. The average yearly requirement for the past two years has been 3,000 pallets, a quantity which can be applied realistically to this year as well. The need for replacement pallets is relatively constant and the cost associated with the placing and receipt of an order is Rs. 1,500.00. The inventory cost policy that Krispy Crisps has traditionally employed is to charge 18% of the purchase cost as the annual inventory cost for any item in inventory. The standard price charged by the major manufacturing company is Rs. 800.00 per pallet.

3.3.1 Determine the optimum order quantity and the consequent time between the orders.

(06 marks)

3.3.2 Describe the assumptions you have made in part (3.3.1).

(02 marks)

3.3.3 The manufacturer offers a discount of 3% if Krispy Crisps order 2,000 or more pallets at a time. Show that the discount is not financially beneficial to Krispy Crisps.

(06 marks)

QUESTION 4

A company has received a contract to supply gravel for three new construction projects located in towns A, B and C. Construction engineers have estimated the required amounts of gravel, which will be needed at the three constructions sites as follows:

Project location	Weekly requirement (truck loads)
A	144
B	204
C	82

The company has three gravel pits located in areas X, Y and Z. The gravel required by the construction projects can be transported from the three pits. The amount of gravel, which can be supplied by each pit, is as follows.

Pit	X	Y	Z
Amount available per week (Truck loads)	152	164	154

The company has computed the delivery cost from each pit to each and every site and these costs are shown in the table Q_4.

Pit	Project location and Cost (Rs.'000)		
	A	B	C
X	2	4	4
Y	8	12	8
Z	4	8	12

Table Q_4

Schedule the delivery from each pit to each project site in such a manner, so as to minimise the total transportation cost within the constraints imposed by pit capacities and project requirements.

(20 marks)

QUESTION 5.

5.1 Explain the importance of quality management in a production system.

(04 marks)

5.2 How are mean ($\overline{X}$) and range (R) charts used together?

(04 marks)

5.3 The city supermarket has a large meat locker in which a constant temperature of approximately 40°F should be maintained. The market manager has decided to construct control charts to monitor the temperature inside the locker. The manager had one of the supermarket employees take sample temperature readings randomly five times each day for 10 days in order to gather data for the control charts. Table Q_5 gives temperature sample observations.

Sample	Temperature (°F)				
1	46.3	48.1	42.5	43.1	39.6
2	41.2	40.5	37.8	36.5	42.3
3	40.1	41.3	34.5	33.2	36.7
4	42.3	44.1	39.5	37.7	38.6
5	35.2	38.1	40.5	39.1	42.3
6	40.6	41.7	38.6	43.5	44.6
7	33.2	38.6	41.5	40.7	43.1
8	41.8	40.0	41.6	40.7	39.3
9	42.4	41.6	40.8	40.9	42.4
10	44.7	36.5	37.3	35.3	41.1

Table Q_5

5.3.1 Construct the mean and range charts.

(10 marks)

5.3.2 Does it appear that the temperature is in control according to the criteria established by management?

(02 marks)

(Note. Further useful information is available at the end of this question paper)

QUESTION 6.

6.1 Distinguish the difference between time study and activity sampling.

(03 marks)

6.2 Explain why is it more beneficial in breaking down jobs into constituent elements for a time study exercise and state the basic rules involved in selecting work elements.

(06 marks)

6.3 Discuss the term "rating the element" clearly indicating the relationship and associated details of observation time, basic time and standard time.

(06 marks)

6.4 Comment on the statement "to achieve the maximum efficiency, the man-machine system must be designed as a whole". *(05 marks)*

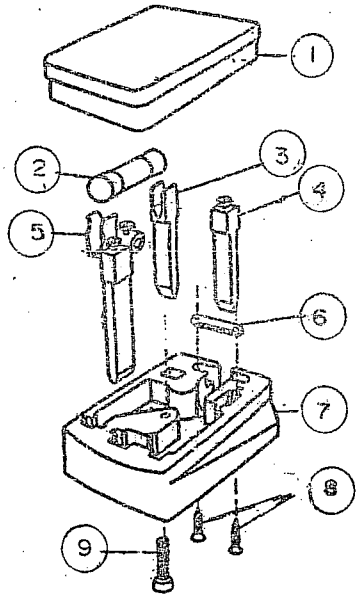
QUESTION 7.

7.1 State the steps involved in conducting a method study for a new job.

(02 marks)

7.2 Figure Q_7 shows a 15-amp plug assembly. Parts are named aside of the figure. Some of the parts are pre-assembled for easy operation. The order of the assembly is as follows;

I. Insert the cord grip into the base.
II. Invert the base.
III. Run the two cord-grip screws.
IV. Invert the base subassembly.
V. Insert in any sequence the live pin, the neutral pin and the earth pin together with fuse clip.
VI. Insert the fuse.
VII. Place the top cover.
VIII. Invert the base sub-assembly.
IX. Run the cover screw.



1- Top Cover
2- Fuse
3- Live pin
4- Neutral pin (sub-assembly)
5- Earth pin with fuse clip (sub-assembly)
6- Cord grip
7- Base
8- Cord grip screws
9- Cover screw

Figure Q_7

7.2.1 Draw a suitable layout of the assembly, providing separate bins for each component, separate area of assembly with screw driver and rack for final assembly.

(06 marks)

7.2.2 Construct a two handed process flow chart for the assembly, considering the layout you suggested. Use the worksheet provided with the question paper.

(12 marks)

QUESTION 8.

Write short notes on any **four (04)** of the following.

8.1 Process layout and product layout with examples of such layouts.

8.2 Group Technology and its benefits.

8.3 Preventive maintenance and breakdown maintenance with their advantages.

8.4 Computer-based systems that support the "today's factories".

8.5 Impact of the government interventions in the operation of the price mechanism in maximum and minimum price fixing.

8.6 Management accounting and cost accounting.

(4X05 = 20 marks)

END

DETAILS REQUIRED FOR QUESTION NO. 05

Sample Size (n)	Constant (d_n)	Factors (m) for Warning Limits $= 1.96/(d_n \sqrt{n})$	Factors (m) for Action Limits $= 3.09/(d_n \sqrt{n})$
2	1.128	1.23	1.94
3	1.693	0.67	1.05
4	2.059	0.48	0.75
5	2.236	0.38	0.59
6	2.334	0.32	0.50
7	2.704	0.27	0.43
8	2.847	0.24	0.38

Control limits: $\overline{X} \pm m\overline{W}$

FACTORS IN MEAN CONTROL CHARTS

Sample Size (n)	Factor (R)			
	For Warning Limit		For Action Limits	
	Upper	Lower	Upper	Lower
2	2.81	0.04	4.12	0.00
3	2.17	0.18	2.98	0.04
4	1.93	0.29	2.57	0.10
5	1.81	0.37	2.34	0.16
6	1.72	0.42	2.21	0.21
7	1.66	0.46	2.11	0.26
8	1.62	0.50	2.04	0.29

Control limits: multiply W by R

FACTORS IN RANGE CONTROL CHARTS

WORK SHEET FOR QUESTION NO. 7

LEFT HAND	O	⇨	▽	D	O	⇨	▽	D	RIGHT HAND

TWO-HANDED PROCESS CHART