

**THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
BACHELOR OF TECHNOLOGY – LEVEL 6
FINAL EXAMINATION 2008/2009**



MEX 6340– INDUSTRIAL ENGINEERING

**DATE : 25 MARCH 2009
TIME : 1400 HRS -1700 HRS
DURATION : THREE HOURS**

Answer any five (05) Questions. All Questions carry equal marks.

- Q1. a) State two methods, which can be employed to solve a linear programming model.
- b) What are the assumptions you make in “transportation algorithm” method?
- c) A company decides to produce two new models of electrical equipments, model XP and model XQ. The company earns a profit of Rs 400.00 and Rs 450.00 for the models XP and XQ respectively. The manufacturing times of both products consist of assembly and testing. The assembly time for the product XP is 12hrs and that for XQ is 10hrs while the testing time for XP is 5hrs and that for XQ is 7hrs. If the total assembly time available at the facility is 2,600 hrs and the total testing time available is 1,100hrs, calculate the maximum possible profit for a product combination of XP and XQ by using simplex method.
- Q2. A production system has six different manufacturing departments A, B, C, D, E & F, each having a square shaped shop floor with an area of 100 square meters. It is necessary to design a plant layout by organizing them within a rectangular building having a floor area of 20m X 30m. Following travel chart shows the movement of items in meters 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	-

Additional information available is as follows:

Common facilities are utilized by the departments C and D. The departments A and B should be kept as close as possible for purposes of 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 diagram and the final layout based on relationship diagram and the constraints.
- Q3.
- a) Discuss the benefit of Just-In-Time (JIT) production systems.
 - b) Use sketches to explain R-Order Level (ROL) policy with Continuous Review and ROL policy with Periodic Review. Discuss the advantages and drawbacks of the two ROL policies.
 - c) In the Mech Industries Co. Ltd, the demand (D) for a product is 27,000 units per year. The other information related to the product is as follows.

Ordering Cost = C_o = Rs 1500/- per order
Price of the product = P = Rs 75/- per unit
Holding cost = C_h = Rs 10/- unit/month
Lead time = L = 1 week

If the company wants to maintain a buffer stock of 100 units.

Determine:

- i. Economic order quantity (EOQ)
- ii. Re-order level
- iii. Annual total cost, and
- iv. Cycle length

Proof is necessary for EOQ with buffer stock. The other relationship can be used without any proof.

- Q4.
- a) Differentiate between continues and repetitive operations. Give examples for each.
 - b) Assembly operation of a product consists of eight elemental tasks and the relevant preceding relationship diagram is shown in fig. Q4. Standard times for each task are shown in minutes.

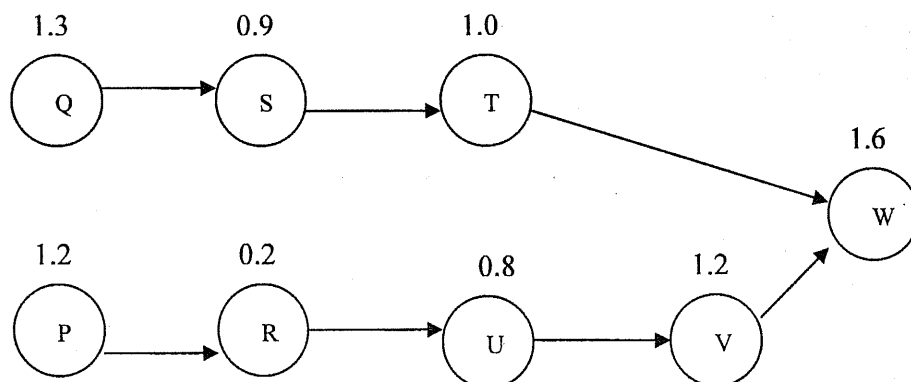


Fig. Q4

- i. What would be the cycle time for a line with one work station?
- ii. What is the shortest processing cycle time?
- iii. It is desired to assemble 160 products during a 420 minute working day. Plan a balance line for the assembly operation.

- Q5. a) What are the three types of charts that depend on the subject of the flow chart? Explain briefly.
- b) Describe the events or actions which are classified into the five groups in flow process chart.
- c) There are 30 steps for Engine stripping, cleaning and degreasing in an Automobile workshop as given below. Prepare Material type flow process chart for the procedure.
1. Stored in old-engine store
 2. Engine picked up
 3. Transported to next crane
 4. Unloaded to floor
 5. Picked up
 6. Transported to stripping bay
 7. Unloaded to floor
 8. Engine stripped
 9. Main components cleaned and laid out
 10. Components inspected for wear; Inspection report written
 11. Parts carried to degreasing basket
 12. Loaded for degreasing
 13. Transported to degreaser
 14. Unloaded into degreaser
 15. Degreased
 16. Lifted out of degreaser
 17. Transported away from degreaser
 18. Unloaded to ground
 19. To cool
 20. Transported to cleaning benches
 21. All parts cleaned completely
 22. All cleaned parts placed in one box
 23. Awaiting transport
 24. All parts except cylinder block and heads loaded on trolley
 25. Transported to engine inspection section
 26. Parts unloaded and arranged on inspection table
 27. Cylinder block and head loaded on trolley
 28. Transported to engine inspection section
 29. Unloaded to ground
 30. Stored temporarily awaiting inspection

- Q6. a) Define "Critical Path" and "Dummy activity"
- b) A company involved in construction wishes to construct pilot plant for a Municipal council for the treatment of domestic waste. The activities for this project are as shown in the table Q6.

	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 Q6

- i. Draw a project network for the above project.
 - ii. Find the earliest and latest start and finished dates for activities.
 - iii. What is the minimum time to complete the project?
 - iv. What is the critical path?
 - v. How can several activities be managed, if personnel are limited?
- Q7. a) What are the objectives and benefits of a Material Requirement Planning (MRP) module and Enterprise Resource Planning (ERP) system?
- b) You are asked to develop a MRP system for a manufacturing organization. Describe the three types of information you are going to include in the System?
- c) Customer requires 80 numbers of units in 8th week and 100 numbers of units in 13th week from product A. Considering the collection of bills, current stocks, lead times and lot size rule as indicated in the Tables Q7.1 and Q7.2. Prepare order release schedule for all components and sub assemblies. Suggest ways and means to reduce the manufacturing lead times.

Collection of Bills for product A – Desk Set

Product	Item #	Quantity	Part #	Part Name
Product A Desk Set	1	1	B	Holder assembly
	2	1	G	Pen
	3	1	H	Pencil
Part B Holder assembly	1	1	C	Base
	2	2	E	Holder
	3	2	F	Holder bolt
Part C Base	1	1	D	Base blank

Table Q7.1

Lead Time, Lot size & Current Stock Status

Item	A	B	C	D	E	F	G	H
Available Stock	0	85	0	60	400	50	35	200
Lot Size Rule	0	100	100	200	500	500	110	220
Lead Time (weeks)	1	2	3	4	2	3	6	6

Table Q7.2

- Q8. a. Define the concept of 'Productivity'.
- b. Explain the use of Work Study to determine Productivity in the context of Management, Labour, Society and Industry.
- c. What is the primary objective of Method Study and how is it achieved? Submit your answer in detail.
- d. What is Ergonomics? Why is it important?
- e. What is meant by 'Work Measurement'? What are the objectives of Work Measurement in industry?

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