ENGINEERING TRIPOS   PART IIA

Wednesday 28 April 2010   9 to 10.30

Module 3E10

OPERATIONS MANAGEMENT FOR ENGINEERS

*Answer not more than **two** questions.*

All questions carry the same number of marks.

*The **approximate** percentage of marks allocated to each part of a question is indicated in the right margin.*

There are no attachments.

STATIONERY REQUIREMENTS   SPECIAL REQUIREMENTS
Single-sided script paper   CUED approved calculator allowed

You may not start to read the questions
printed on the subsequent pages of this
question paper until instructed that you
may do so by the Invigilator

Final version

1   (a)   Explain why firms use forecasts. Illustrate with one brief example.   [20%]

(b)   A distinction is often made between qualitative and quantitative approaches to forecasting. Briefly explain the difference, and for each approach give one example of a method used, and one problem associated with the approach.   [20%]

(c)   The table below gives the demand for a product for nine periods. Use the 4-period moving average to calculate forecasted demand from time 1 up until time 5. Use exponential smoothing (ES) with $\alpha = 0.2$ to forecast demand from time 2 until time 5. For exponential smoothing use X_t of time 0 as the forecast of time 1 to calculate your forecast from time 2 onwards.

Time	Demand
-3	201
-2	197
-1	190
0	208
1	201
2	185
3	182
4	220
5	200

[40%]

(d)   Compare the use of a large value of α with the use of a small value of α in simple exponential smoothing.   [20%]

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2   A manufacturer has fifty hours to complete the processing of ten jobs, A-J, all of which have to go through two consecutive processes. The first is printing and the second is binding. The technology is such that two jobs cannot be processed together. Each job requires the same machine for the first operation (printing), of which there is only one, and the same machine for the second operation (binding) of which there is also only one. If necessary, entire jobs (printing plus binding) can be subcontracted, the cost of which is the same for all jobs. The times needed for the two processes are given in the table below:

Job	A	B	C	D	E	F	G	H	I	J
Printing	6	13	11	10	5	9	11	12	5	7
Binding	2	7	8	1	4	10	13	14	3	5

(a)   If the deadline of fifty hours is to be met and the manufacturer wants to minimise the total cost of subcontracting jobs, provide the optimal schedule and indicate which jobs have to be subcontracted. State which approach you use.   [35%]

(b)   Due to an unforeseen event the supplier to which the manufacturer used to subcontract jobs has gone bankrupt and no other suppliers are available. Fortunately, at the same time, an increase in the popularity of the manufacturer's products means that its customers are willing to wait longer than the previous fifty hours. Nevertheless, the manufacturer still attempts to bring its products to the market as quickly as possible. Does the schedule above change now that the manufacturer has decided to produce everything in house? If the schedule changes, give the new schedule and its completion time. State which approach you use.   [35%]

(c)   Discuss three important considerations for firms when they decide to subcontract jobs.   [30%]

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3   Toyota Production System (TPS), also known as Lean Manufacturing, and Six Sigma are two much studied process improvement approaches in manufacturing and service industries.

(a)   Compare Lean Manufacturing with traditional mass production with regards to scheduling, orders and processes.   [30%]

(b)   (i)   Give two definitions of waste as it is used in Lean Manufacturing.   [12%]

        (ii)   Which wastes are identified in TPS? Briefly describe each waste.   [28%]

(c)   (i)   Which of these wastes identified in TPS is the focus of Six Sigma?   [5%]

        (ii)   What is the cause of this waste according to Six Sigma?   [5%]

        (iii)   How does Six Sigma tackle this cause?   [10%]

        (iv)   What role does the customer play in the Six Sigma approach?   [10%]

4 (a) Discuss three reasons for firms to hold inventory, and three reasons why firms should not hold inventory. [30%]

(b) Inventory placed in the supply chain is known as a "decoupling point". What is the main consequence for the processes in the supply chain of having such a decoupling point? Give one advantage and one disadvantage of using decoupling points. [30%]

(c) Explain the role of inventory in the Theory of Constraints. [20%]

(d) Give two examples of how holding raw materials inventory differs from holding finished goods inventory. [20%]

END OF PAPER

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