EGT2: IIA
ENGINEERING TRIPOS PART IIA

Tuesday 22 April 2014   9.30 to 11

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.*

*Write your number **not** your name on the cover sheet.*

STATIONERY REQUIREMENTS
Single-sided script paper

SPECIAL REQUIREMENTS TO BE SUPPLIED FOR THIS EXAM
CUED approved calculator allowed

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

1   (a)   The product-process matrix helps organisations identify the type of production approach they should use for a product.

    (i)   Describe the product-process matrix for manufacturing organisations, and identify the key advantages and disadvantages of each process type.   [25%]

    (ii)   Mass Customisation combines the flexibility and personalisation of "custom-made" with the low unit costs associated with mass production. How can this concept be reconciled with the product-process matrix?   [10%]

(b)   How do the basic characteristics of service operations differ from manufacturing operations?   [25%]

(c)   Most manufacturing operations have three categories of inventory: Raw Materials (RM), Work-in-Process (WIP), and Finished Goods Stock (FGS). Describe how the inventory might be split between the three categories for manufacturers making high-volume, Make-to-Stock (MTS) items such as fast-moving consumer goods, and manufacturers making low-volume, Make-to-Order (MTO) products such as luxury automobiles.   [15%]

(d)   You are an operations consultant at a firm. You have been called in to help the Accounting department. They receive an average of 1,000 payments per week. There is an average of 500 cheques waiting to be deposited. The cheques coming in are classed as being either small or large. Small cheques have an average value of £500 and large cheques have an average value of £5,000. 20% of the cheques coming in are large and the rest are small. Currently there is no distinction between the processing times of the large and small cheques. As a result, 20% of the cheques waiting to be processed are large. You have been asked whether it is worthwhile to reallocate resources (at no additional cost to the company) so that large cheques wait an average of 0.3 weeks, while small cheques wait an average of 0.8 weeks, before being processed.

    (i)   What is the average time spent by each cheque waiting to be deposited?   [10%]

    (ii)   What is the current inventory of cheques in terms of monetary value?   [10%]

    (iii)   Is it worthwhile to reallocate resources as described above? Justify your answer with a brief explanation.   [5%]

2   (a)   Consider the problem of minimising average tardiness on one machine with the processing times and due dates shown in Table 1:

Job	1	2	3	4
p_j	7	6	8	4
d_j	8	9	10	14

Table 1

Find the schedule with which you can obtain minimum average tardiness.   [20%]

(b)   Cambridge Leafy Houses Ltd. is a local residential property development company. The owner of the company, Mr. Alcock, is considering whether to outsource the kitchen and bathroom tile fitting and wall painting work to another local company, HomeWorks. One of the main requirements in obtaining this contract is rapid delivery time. Mr. Alcock says that if HomeWorks can fit and paint five newly completed small studio flats in 24 hours or less, the contract will be theirs. Table 2 shows the time (in hours) required for tile fitting and painting in each of the five flats.

Flat	Tile fitting Time (hours)	Painting Time (hours)
A	6	3
B	0	4
C	5	2
D	8	6
E	2	1

Table 2

Assuming that flats go through the tile fitting operation before they are painted, can HomeWorks meet the time requirements?   [40%]

(c)   (i)   Describe the differences between outsourcing and offshoring.   [10%]

(ii)   Discuss the key benefits and risks of a company outsourcing its manufacturing activities.   [30%]

3   (a)   Explain the key elements of the Total Quality Management approach.   [30%]

(b)   (i)   Provide a definition of bottleneck in the context of operations management. [10%]

(ii)   What are the differences between a floating bottleneck and a fixed bottleneck in a manufacturing system?   [10%]

(iii)   Describe two negative effects of a non-bottleneck operation running faster than the bottleneck in a manufacturing environment.   [10%]

(c)   According to the Theory of Constraints, what steps would you follow to increase throughput?   [20%]

(d)   Taichi Ohno outlined 'seven deadly wastes'. Define these seven wastes, and describe which waste you consider to be the worst and why.   [20%]

END OF PAPER