UNIVERSITY OF LONDON

279 0035 ZB

BSc degrees and Diplomas for Graduates in Economics, Management, Finance and the Social Sciences, the Diploma in Economics and Access Route for Students in the External Programme

Production and Operations Management

Friday, 26 May 2006 : 2.30pm to 5.30pm

Candidates should answer **FIVE** of the following **SIX** questions: **TWO** from Section A and **THREE** from Section B. All questions carry equal marks.

Graph paper is provided. If used, it must be fastened securely inside the answer book.

Workings should be submitted for all questions requiring calculations.

A hand held calculator may be used when answering questions on this paper but it must not be pre-programmed or able to display graphics, text or algebraic equations. The make and type of machine must be stated clearly on the front cover of the answer book.

SECTION A

Answer **both** questions from this section.

1.   (a)   Briefly describe what the term 'cellular manufacture' means.

      (b)   What is meant by the term 'Quality Circle'? How does it operate?

      (c)   Assume that you have a batch of 10 jobs. All the jobs go through process X first and then process Y. The total time taken by the ten jobs on process X is 620 minutes while the total time taken on process Y is 680 minutes. Assume that you can apply Johnson's rule to determine the best sequence for the 10 jobs. What additional information would you need to determine the theoretical make span time?

      (d)   The term safety stock is used in Inventory Control. Why do you need safety stock? What factors influence the amount of safety stock held in a company?

2.   A company currently buys a component in quantities of 600 units. The annual usage of this component is 7200 units. The price charged by the supplier is £10.50 per unit. The cost of placing an order is £140 and the company uses an interest figure of 12% per year. The company wishes to reduce the annual cost of this component. With this in view, the company carried out some trials to manufacture this component on one of the machines that the company has. The machine can make the component at the rate of 6000 units a month and the part is available for use as soon as it is made. Two trials have been carried out. The first one was for 600 units and the total cost (including material, labour, overheads, machine set up costs and the cost of carrying the inventory) was calculated as £81,924. A second trial with 1200 units as the quantity produced a cost figure of £77,848 on a same total cost basis.

      Required:

      (a)   What is the current total annual cost?

      (b)   Can this cost be reduced in any way? If so, how?

      (c)   If, the company decides to manufacture the component on the machine mentioned above, how many units should be made to minimize the cost? Would that option be better than the solution in (b) above?

Answer any **three** questions from this section.

3. The operations time and the precedence restrictions involved in an assembly line are shown below:

Operations	Operation time in minutes	Immediate predecessor operation(s)
A	4.5	None
B	7.0	A
C	5.0	A
D	1.0	A
E	4.5	None
F	3.0	B, C, D and E
G	1.5	A
H	3.0	A
I	2.0	G
J	2.5	F
K	1.0	H
L	2.0	None
M	3.0	J

Required:

(a) Draw the network, using the activity on the arrow system, of the operations.

(b) Determine the earliest and latest start time for each node.

(c) Determine the critical path and the duration.

(d) If two operators are assigned for each assembly line, determine how they could share the workload between them.

(e) You may assume for this part of the question that any number of operators can be assigned to the assembly line. Equally, any number of assembly lines can be built. If exactly six units of the assembly are required per hour, how many assembly lines would you have and on each line, how many operators would you assign? What assumptions have you made, if any, in arriving at the answers you have given?

4.	The plant of an engineering conglomerate produces heavy lifting machinery. The plant is located in a fairly small town and is, therefore, treated as a major employer in that town. The sales representative makes the initial contact with the customers throughout the country. The decision by the customer as to whether to buy the product from this company depends upon the price quoted and the delivery time for the machinery. The customer may not buy again from the same company if the above features are not met. In addition, the customer can specify any extra features from a list that the sales representative carries. The manufacture of the piece of machinery can thus become customer-specific. In order to win the customer order, sometimes the company anticipates the likely specification of the order and manufactures the anticipated order but there is no guarantee that the order will be won. If it fails, then the piece of machinery is disassembled and the subassemblies used elsewhere. This type of speculative order is used to utilise the full capacity of the plant. As a newly appointed General Manager you have been asked to make changes to the working practices so that the costs can be reduced and the company made more profitable.

Required:

Write a report explaining what you consider to be the main problem areas with the current procedures and how you propose to tackle them.

5.	A firm manufactures two products that require processing in each of two departments X and Y. Product A provides a profit contribution of £300 and requires 5 hours in department X and 12 hours in department Y. Product B on the other hand provides a profit contribution of £700 and requires 8 hours in department X and 6 hours in department Y. The available capacities of X and Y for next week are 40 hours and 48 hours respectively.

Required:

(a)	Calculate the maximum output of each type of product that could be produced next week and also the associated profit contribution when

i.	The two products are two types of textiles and one unit of the product would be 1000 meters of cloth
ii.	The products are two types of machine tools and part production is not allowed.

(b)	Determine what difference, if any, would be made to the above answers if the time taken by product A in department X is 4 hours instead of 5 hours.

6. A company has to decide whether it should buy machine X or machine Y for the manufacture of a part. The demand for this part is expected to last at least 10 years. The company uses an interest rate of 15% in investment decisions. The following data are available for the two machines. You are to assume that in both cases the relevant operating and maintenance costs are incurred at the end of each year of use.

Machine X
Purchase Price £37,000
Annual operating and maintenance cost during first year of operation £10,000
Annual operating and maintenance costs in subsequent years £12,000
The life of the machine 5 years
Scrap value at the end of the life £700
Depreciation – straight line over 5 years.
Resale value of machine at the end of any year = book value of the machine.

Machine Y
Purchase Price £60,000
Annual operating and maintenance cost during first year of operation £6,000
Annual operating and maintenance cost during subsequent years £7,000
The life of the machine 6 years.
Scrap value at the end of the life is £6,000
Depreciation – straight line over 6 years.
Resale value at the end of any year = book value of the machine

Required:

Recommend which machine the company should buy and why.

END OF PAPER
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