

元智大學 100 學年度研究所 碩士班 招生試題卷

系(所)別：工業工程與管理
學系碩士班

組別：不分組

科目：生產管制

用紙第 1 頁共 2 頁

●不可使用電子計算機

1. (30%) The manager of a firm needs to decide how to obtain a particular part for the next year. The part can be produced by the firm itself with the choice of two options. Option 1 would have an annual fixed cost of \$20,000 and a variable cost of \$9 per unit of part produced. Option 2 would have an annual fixed cost of \$30,000 and a variable cost of \$7 per unit. The part can also be purchased from one of the three qualified vendors. Vendor A offers a price of \$11 per unit. Vendor B has a price of \$12 per unit if annual purchasing quantity is 2,000 units or less and \$10 per unit if annual quantity is greater than 2,000 units. Vendor C provides a price of \$12 per unit for the first 4,000 units and \$8 per unit for additional units. The manager needs to choose one of the above five alternatives to minimize total annual cost (including variable cost, fixed cost and purchasing cost).
 - (a) (10%) If it is expected that 12,000 units of the part are required, which alternative would be best?
 - (b) (20%) Determine the range of demand for the part for which each alternative is best.

2. (20%) A work center uses a kanban system to control the movement of incoming parts which are shipped in containers. The work center operates 8 hours per day. Each container holds 50 parts and currently 8 containers are authorized. The average time to replenish a container is 2 hours. Management would like to operate the work center with 100% efficiency.
 - (a) (7%) What daily usage rate of this part can be met with this system?
 - (b) (5%) What is the maximal possible inventory of this part in the system?
 - (c) (8%) According to monthly forecast, customer demand will decline and thus the usage rate of this part will decrease by 12%. Management is considering reducing the number of containers used in this work center. How many containers can be reduced while maintain the same efficiency?

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3. (30%) A firm purchases two items, item A and item B, from the same supplier. The purchase price is \$16 per unit for item A and \$50 per unit for item B. An ordering cost of \$100 occurs each time an order is placed for all orders. Annual holding costs are 25% of the purchase price. The firm uses an average of 20,000 units of item A and 10,000 units of item B per year.
- (a) (10%) Determine the optimal order quantities of item A and item B, and the optimal time between placements of orders of these two items.
- (b) (20%) If both items are ordered and received simultaneously, it is treated as a single order placement and the ordering cost of \$100 applies to the combined order. Compare the average annual cost of holding and ordering with the following three ordering policies: 1) these items are ordered separately; 2) they are both ordered when item A would normally be ordered (your answer in part a)); and 3) they are both ordered when item B would normally be ordered (your answer in part a)). Which policy has the lowest average annual cost?
4. (20%) In order to increase its productivity, a firm implemented a process improvement program. The new process requires one additional worker but needs less material input. As a result, the output is increased by 25%. Under the old process, 5 workers could produce 60 units per hour and material input was \$13 per unit. With the new process, material input is reduced to \$10 per unit. Labor costs remain the same at \$12 per hour per worker and overhead is charged at 1.5 times direct labor costs. Finished units sell for \$31 each. What increase in productivity is associated with the process improvement?