1. (10%) TsingHua Tech is ready to produce a new product called IEbest.    The company is evaluating three approaches of production

(A) A small production facility with older equipment

(B) A larger production facility that is more automated

(C) Outsourcing to an Electronic Manufacturing Service provider

The costs of each alternative are shown below.    Determine for what level of demand each production process should be chosen.

| Process | Fixed Cost | Variable Cost |
|---|---|---|
| A | $200,000 | $40 |
| B | $600,000 | $20 |
| C | $0 | $60 |

2.    (8%) Construct a network from the following information and compute the earliest start and finish times, latest start and finish times, and slack for each activities.    What are the critical path and project completion time?

| Activity | Activity Predecessor | Time (Weeks) |
|---|---|---|
| 1 | - | 7 |
| 2 | - | 10 |
| 3 | 1 | 6 |
| 4 | 2 | 5 |
| 5 | 2 | 4 |
| 6 | 3,4 | 3 |
| 7 | 5,6 | 2 |

3. (14%) Managers at the TsingHua Inn are concerned about the increasing number of guests who make reservations but fail to show up. They have decided to institute a policy of overbooking. The profit from a paying guest average $50 per room per night. The cost of putting up a guest at another hotel is $100 per room per night. Records show the following number of no shows over the past three month. How many rooms should TsingHua Inn overbook? What is the saving of overbooking?

| No-Shows | Frequency |
|----------|-----------|
| 0 | 18 |
| 1 | 36 |
| 2 | 27 |
| 3 | 9 |

4. (14%) TsingHua Building Supply Company has received the following orders for boards in three length:

| Length | Order |
|--------|-------|
| 7 | 700 |
| 9 | 1200 |
| 10 | 500 |

The company has 25-foot standard-length boards in stock. Therefore, the standard-length boards must be cut into the lengths necessary to meet order requirements. The company wishes to minimize the number of standard-length boards used. The company must, therefore, determine how to cut up the 25 foot boards in order to meet the order requirements and minimize the number of standard boards used. Formulate the linear programming model for this problem.

5. (10%) Partially completed products arrive at a workstation in a manufacturing operation at a mean rate of 40 per hour (Poisson distributed). The processing time at the work station averages 1.2 minutes per unit (Exponentially distributed). The manufacturing company estimates that each unit of in-process inventory at the workstation costs $31 per day (on the average). However, the company can add extra employees and reduce the processing time to 0.9 minutes per unit at a cost of $52 per day. Determine whether the company should add extra employees. (Hint, the average customer in system for M/M/1 is $\lambda/(\mu-\lambda)$).

6. (24%)單或多選題
(1) What are the activities involved in the production activity control(PAC)?
   a. issuing manufacturing orders or dispatching list to each production line
   b. providing input-output control on all production lines or work centers
   c. measuring the efficiency, utilization and productivity of workers and machines at each production line
   d. keeping the WIP inventory updated
   e. meeting the schedules and due-dates
(2) In a general job shop, the average flow time is minimized by the following rule: (a)SPT (b)EDD (c)FCFS (d)CR(Critical Ratio) (e)None of the above
(3) What are the major sources of waste? (a) Overproduction (b) Rework (c) Waiting (d) Inventory (e) Transport
(4) What are the major concepts of lean production?(a) eliminate waste (b) Kaizen (c) pull system (d) automation (e) value stream
(5) What factors do you consider when evaluate a supplier? (a) Quality (b) Cost (c) Delivery time (d) R&D capability (e) factory size
(6) Which statement in MRP is correct? (a) planned order receipts indicate open purchase order (b) when an order is released it becomes a planned order (c) scheduled receipts show when material is put into inventory (d) the planned order release of the parent generates the gross requirement of the component (e) none of the above is correct.

(7) Which of the following are the assumptions of the EOQ model? (a) demand is relatively constant and known (b) the item is produced continuously (c) ordering costs and inventory carrying costs are known (d) receipt of inventory is instantaneous (e) lead times are known and constant.

(8) What factors determine the safety stock level? (a) average demand rate (b) replenishment lead time (c) price of stock item (e) demand and lead time variability (f) desired service level.

7. (20%)生產線平衡問題(Line Balancing Problem)發生在什麼特性的生產系統上，試舉例說明之？ 另請論述此問題的基本假設與必要條件為何？ 擬追求什麼目標?