

Mid Term Exam

**Instructions:**

Time limit 120 minutes

Assume the values, where necessary.

Provide reasoning where appropriate.

Q1)

A) List four basic activities carried out in a factory to convert raw material into finished goods

for discrete products. (2 marks)

B) Draw Relationship between Plant Layout and Type of Facility (4 marks)

C) The average part produced in a certain batch manufacturing plant must be processed through an average six machines. Twenty (20) new batches of parts are launched each week. Average operation time = 6 min., average setup time = 5 hours, average batch size = 25 parts, and average nonoperation time per batch = 10 hr/machine. There are 18 machines in the plant. The plant operates an average of 70 production hours per week. Scrap rate is negligible. **Determine:** (a) manufacturing lead time for an average part, (b) plant capacity, (c) plant utilization, (d) average level of work-in-process in the plant. (6 marks)

Q2)

A) Draw Relationship between Production Quantity and Product Variety (3 marks)

B) Costs have been compiled for a certain manufacturing company for the most recent year. The summary is shown in the table below. The company operates two different manufacturing plants, plus a corporate headquarters. **Determine:** (a) the factory overhead rate for each plant, and (b) the corporate overhead rate. These rates will be used by the firm in the following year. (4 marks)

Expense category	Plant 1	Plant 2	Corporate headquarters
Direct labor	\$1,000,000	\$1,750,000	
Materials	\$3,500,000	\$4,000,000	
Factory expense	\$1,300,000	\$2,300,000	
Corporate expense			\$5,000,000

C) The hourly rate for a certain work center is to be determined based on the following data: direct labor rate = \$15.00/hr; applicable factory overhead rate on labor = 35%; capital investment in machine = \$200,000; service life of the machine = 5 years; rate of return = 15%; salvage value in five years = zero; and applicable factory overhead rate on machine = 40%. The work center will be operated two 8-hour shifts, 250 days per year. **Determine** the appropriate hourly rate for the work center. (5 marks)

Q 3)

A) List subsystems in Computer Integrated Manufacturing. (3 marks)

B) Draw traditional and Concurrent Engineering Product development approaches. What is the fundamental advantage of Concurrent Engineering over traditional approach? (2 + 2 + 1 marks)

C) List any eight principles of Design for manufacturing and Assembly (4 marks)

Q4)

A)

a) When to prefer "skate wheel conveyor" over "roller conveyor"?

b) When to prefer "slat conveyor" over "flat belt conveyor"?

c) When to prefer "Power-and-free trolley" over "Overhead trolley"? (3 marks)

B) A recirculating conveyor has a total length of 700 ft and a speed of 90 ft/min. Spacing of part carriers = 14 ft. Each carrier can hold one part. Automatic machines load and unload the conveyor at the load and unload stations. Time to load a part is 0.10 min and unload time is the same. To satisfy production requirements, the loading and unloading rates are each 2.0 parts per minute. Evaluate the conveyor system design with respect to the three principles developed by Kwvo. (2 + 2 + 1 marks)

C) An overhead trolley conveyor is configured as a continuous closed loop. The delivery loop has a length of 120 m and the return loop = 80 m. All parts loaded at the load station are unloaded at the unload station. Each hook on the conveyor can hold one part and the hooks are separated by 4 m. Conveyor speed = 1.25 m/s. Determine: (a) maximum number of parts in the conveyor system, (b) parts flow rate; and (c) maximum loading and unloading times that are compatible with the operation of the conveyor system? (1 + 2 + 1 marks)

Q5) List names of your class project team members excluding yourself and rate their participation in the team from 0 to 12. (12 marks)