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**Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019**  
**Automation in Manufacturing**

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting at least TWO questions from each part.**

**PART – A**

- 1
  - a. Define automation and write the characteristics [any 4] of flexible automation. (10 Marks)
  - b. List five reasons for automation. (05 Marks)
  - c. Write the arguments [any 5] in favour of automation. (05 Marks)
  
- 2
  - a. Explain how Manufacturing Lead Time (MLT) is calculated for batch, job and mass production. (06 Marks)
  - b. Explain the following terms :
    - i) Production capacity
    - ii) Utilization
    - iii) Availability (06 Marks)
  - c. The average part produced in a certain batch manufacturing plant must be processed through an average of six machines. There are 20 new batches of parts launched each week, other pertinent data are as follows :
 

Average operation time = 6 min  
 Average setup time = 5hrs  
 Average batch size = 25 parts  
 Average non operation time per batch = 10 hrs.

 There are 18 machines in the plant. The plant operates an average of 70 production hours per week. Scrap rate is negligible.  
 Determine :
    - i) The manufacturing lead time for an average part
    - ii) The plant capacity
    - iii) The plant utilization. (08 Marks)
  
- 3
  - a. What is WIP ratio? Explain how it is calculated? (06 Marks)
  - b. Explain the automation strategies which will reduce MLT and WIP. (04 Marks)
  - c. An average of 20 new orders are started through a certain factory each month. On average an order consists of 50 parts to be processed through 10 machines in the factory. The operation time per machine for each part is 15min. The non operation time per order at each machine averages, 8 hours, and the required setup time per order = 4 hours. There are 25 machines in the factory, 80% of which are operational at any time (the other 20% are under repair or maintenance). The plant operates 160 hours/month. However, the plant manager complains that a total of 100 overtime machine hours must be authorized each month in order to keep up the production schedule.
    - i) What is the MLT for an average order?
    - ii) What is the plant capacity (on monthly basis), and why must the overtime be authorized.
    - iii) What is the utilization of the plant?
    - iv) Determine the average level of work in process (number of parts in process) in the plant. (10 Marks)

- 4 a. The following data apply to a 12 station in line transfer machine.  
 $p = 0.01$  (all stations have equal probability of failure)  
 $T_c = 0.3$  min (cycle time)  
 $T_d = 3.0$  min (Avg. down time)  
 Using the upper bound approach, compute the following for transfer machine :
- F, the frequency of line stops
  - $R_p$ , the average production rate
  - E, the line efficiency. (06 Marks)
- b. A proposal has been submitted to replace a group of assembly workers, each working individually, with an assembly line, the following table gives the individual work elements.

Element	$T_c$ (min)	Immediate predecessor
1	1.0	-
2	0.5	-
3	0.8	1, 2
4	0.3	2
5	1.2	3
6	0.2	3,4
7	0.5	4
8	1.5	5, 6, 7

The demand rate for this job is 1600 units/week (assume 40 hours/week) and current number of operation required to meet this demand is eight. Using individual manual workers.

- Construct the precedence diagram from the data provided on work element
  - Use largest candidate rule to assign work elements to stations. What is the balance delay for the solution? (10 Marks)
- c. Sketch and explain elements of the part delivery system at an assembly work station. (04 Marks)

### PART – B

- 5 a. Explain with block diagram the general procedure for using one of the retrieval computer aided process planning system. (10 Marks)
- b. List the benefits (any 5) of CAPP. (05 Marks)
- c. List any five problems commonly encountered in planning and managing production operation in a plant. (05 Marks)
- 6 a. With a block diagram, explain three phases in shop floor control system. (10 Marks)
- b. Write a note on any four technologies available for use in automated identification system. (10 Marks)
- 7 a. With a block diagram, explain the hierarchy of computers in a typical manufacturing organization. (10 Marks)
- b. Write a note on common configuration or topologies under Local Area Network. (10 Marks)
- 8 Write note on :
- Trends in manufacturing
  - Future automated factory. (20 Marks)

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