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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B TECH -MECHATRONICS

Subject (Course): MANUFACTURING SYSTEM ANALYSIS

Course Code : MEEL 414

No. of page/s: 03

Semester – VII

Max. Marks : 100

Duration : 3 Hrs

SECTION A (20 Marks)

1. Answer the following questions.
 - i. Do automated manufacturing/assembly systems possess higher reliability. Explain
 - ii. Write the limitations and capabilities of a manufacturing plant.
 - iii. Explain the significance of single station automated cell.
 - iv. Distinguish between cycle time and service time.
 - v. Name the typical hardware components of an automated workstation parts delivery system.

SECTION B (40 Marks)

2. A Geneva mechanism with six slots operates the work table of a dial indexing Machine. The operation time of the slowest workstation on the indexing machine is 2.5 sec. such that the table must be in dwell for this length of time. What is the indexing time of each cycle? At what rotational speed must the driven member of the Geneva mechanism be turned to provide this dwell time.
3. What are the areas that considered in the design and analysis of automated Production line?
4. The following data apply to a 12 station in line transfer machine:
 $p = 0.01$ (all stations have an equal probability of failures)
 $T_c = 0.3$ min.
 $T_d = 3.0$ min.
Using upper bound approach and lower bound approach , compute the following for the transfer machine
 - a) F , the frequency of line stops
 - b) R_p average production rate
 - c) E , the line efficiency.
 - d) What proportion of work parts is removed from the transfer line using lower bound approach.

OR

In an automated flow line, explain the effect on line efficiency due to increase in number of workstations. List the reasons for the existence or selection of partially automated production flow lines.

5. Explain the benefits of Modeling and simulation in the analysis of manufacturing systems.

SECTION C (40 Marks)

6. The table below defines the precedence relationship and element times for a new model toy.
- Construct the precedence diagram
 - If the ideal cycle time = 1.1 min, and uptime proportion is assumed to be 1.0, what is the theoretical minimum number of workstations required to minimize the balance delay under the assumption that there will be one worker per station?
 - Use the largest candidate rule and positional weights method, to assign work elements to stations, compute the balance delay for your solution and compare.

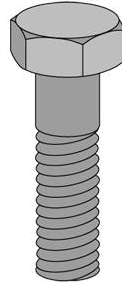
Work Element	T_e (Min)	Immediate Predecessors
1	0.5	--
2	0.3	1
3	0.8	1
4	0.2	2
5	0.1	2
6	0.6	3
7	0.4	4,5
8	0.5	3,5
9	0.3	7,8
10	0.6	6,9

7. A feed selector device at one of the stations of an automated assembly machine has a feed rate of 25 parts per minute and provides a throughput of one part in four. The ideal cycle time of the assembly machine is 10sec. The low level sensor on the feed track is set at 10 parts, and the high level sensor is set at 20 parts.
- How long will it take for the supply of parts to be depleted from high level sensor to low level sensor once the feeder selector device is turned off?
 - How long will it take for the parts to be resupplied from the low level sensor to the high level sensor, on average, after the feeder selector device is turned on?

- c. What proportion of the time that the assembly machine is operating will the feeder selector device be turned on? turned off?

OR

A Threaded bolt as shown in figure needs to be assembled vertically with head on top. Sketch and analyze the selection and orientation mechanism such that the component goes into the workstation in the desired position.



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