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Sixth Semester B.Tech. Degree Examination, June/July 2023
Automation in Manufacturing

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain briefly product systems, with neat sketch.   **(10 Marks)**
  b. Explain briefly Automation principles and strategies.   **(10 Marks)**

OR

2 a. What is production facilities? Explain briefly ranges of production.   **(10 Marks)**
  b. Explain briefly product/production relationship.   **(10 Marks)**

Module-2

3 a. A small component assembly line unit has a market demand of 1,20,000 unit per year. The line operate 50 week/year, 6 shift per week and 8 hour per shift. A company has a single assembly line and assembly work contains the following work element:

Work element	Duration (T_{ek} min)	Precedence
1	0.52	-
2	0.28	1
3	0.46	2
4	0.3	1
5	0.58	4
6	0.48	3, 5
7	0.22	6
8	0.62	7
9	0.1	6
10	0.38	6
11	0.36	10
12	0.7	8, 9, 11

Each station is assigned with one operator. The expected line efficiency is 0.95 and repositioning loss is 0.04 min. Determine using largest candidate rule
  i) The total work content time t_{wc}
  ii) Production rate
  iii) Cycle time t_c
  iv) Theoretical min number of water
  v) Station time   **(12 Marks)**
  b. Write note on :
  i) Repositioning losses
  ii) Line balancing problem   **(08 Marks)**

OR

4 a. A single station assembly machine performs five work elements to assemble four components to a base part. The elements are listed in the table below together with the fraction defect rate (q) and probability of a station jam (m) for each of the components added (NA means not applicable).

Element	Operation	Time	q	m	p
1	Add gear	4	0.02	1.0	
2	Add Spacer	3	0.01	0.6	
3	Add gear	4	0.015	0.8	
4	Add gear with mesh	7	0.02	1.0	
5	Festan	5	0	NA	0.012

Time to load the base part is 3 sec and time to unload the completed assembly is 4 sec. giving a total load/unload time of $T_n = 7$ sec, when a jam occurs, it takes an average of 1.5 min to clear the jam the restart the machine. Determine

i) Production rate of all product   ii) Yield of good product

iii) Production rate of good product   iv) Uptime efficiency of the assembly machine.

(10 Marks)

b. Explain system configuration? List and explain different types of automated assembly systems. **(10 Marks)**

Module-3

5 a. With neat sketch explain Inputs to the MRP systems. **(10 Marks)**

b. Explain briefly AGVS. Explain AGVS vehicle guidance technologies. **(10 Marks)**

OR

6 a. Define Robots? Explain different common Robot configurations. **(10 Marks)**

b. List and explain Robot control systems. **(10 Marks)**

Module-4

7 a. Describe Machine Vision. Explain Basic functions of a machine vision system. **(10 Marks)**

b. Define CMM. Explain CMM constructions. **(10 Marks)**

OR

8 a. Explain briefly Shoop floor control. **(10 Marks)**

b. Explain Bar code technology and its types. **(10 Marks)**

Module-5

9 a. Explain Basic principle of AM? Explain slicing CAD models of AM. **(10 Marks)**

b. Explain any 2 recent trends in AM. **(10 Marks)**

OR

10 a. Write a short note on Future Automated factory and its impact on society. **(10 Marks)**

b. Write a short note on Human workers in future automated factory along with its social impact and advantages. **(10 Marks)**

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