

I SEMESTER M.TECH. (INDUSTRIAL AUTOMATION AND ROBOTICS) END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: AUTOMATED MANUFACTURING SYSTEMS [MTE 5133]

REVISED CREDIT SYSTEM (29/11/2016)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ANY FIVE FULL questions.
- ✤ Missing data may be suitable assumed.
- 1A. Xiaomi, one of the leading mobile seller in India has recently launched Air laptop. (04) Will the company be able to assemble this laptop at its automated cellphone assembling plant at Andhra Pradesh? Justify your answer with type of automation the company must approach.
- 1B. Write a CNC program in word address format for the shown profile in Fig.1B, follow (06) the dimensions as mentioned. Assume that work piece surface is rough, start the programming with end mill operation to remove 2mm layer. Also, mention different tools you used in this programming along with tool numbers.



Fig. 1B: Work piece profile (Dimensions are in mm)

2A. A XYZ company has manufacturing unit which produces different variant of parts (05) and they do not exhibit too much similarity and new part are introduced on a regular basis. For this kind of manufacturing environment, which CAPP module do you suggest? Explain in detail about the module that you suggest.

- **2B.** Write a note on Automated Inspection. Discuss how it will enhance the (03) manufacturing process.
- **2C.** How can you justify installing CNC machines over conventional Machines? (02)
- **3A.** In CNC, center of the tool follows the programmed path. Then how the machining (04) along the edges of billet is possible? Discuss in detail.
- 3B. Summarize the primary functions of guideways in machine tools. List the different (04) types of guideways and explain the effects of coefficient of friction in friction guideways and methods of keeping it minimum but constant.
- **3C.** Define shop floor control. List out the primary functions of the shop floor control (02)
- 4A. An FMS consists of four stations. Station 1 is a load/unload station with one server. (07) Station 2 performs milling operations with three servers (three identical CNC milling machines). Station 3 performs drilling operations with two servers (two identical CNC drill presses). Station 4 is an inspection station with one server that performs inspections on a sampling of the parts. The stations are connected by a part handling system that has two work carriers and whose mean transport time = 3.5 min. The FMS produces four parts. A, B, C, and D. The part mix fractions and process routings for the four parts are presented in the table. Determine:
 - (a) Maximum production rate of the FMS.
 - (b) Corresponding production rate of each part.
 - (c) Utilization of each station in the system.
 - (d) The overall FMS utilization.

Part (j)	Part Mix (Pj)	Operation (k)	Descriptio n	Station (i)	Process Time (tijk) min.	Frequency Fijk
A	0.1	1	Load	1	4	1.0
		2	Mill	2	20	1.0
		3	Drill	3	15	1.0
		4	Inspect	4	12	0.5
		5	Unload	1	2	1.0
В	0.2	1	Load	1	4	1.0
		2	Drill	3	16	1.0
		3	Mill	2	25	1.0
		4	Drill	3	14	1.0
		5	Inspect	4	15	0.2
		6	Unload	1	2	1.0
Part (j)	Part Mix (Pj)	Operation (k)	Description	Station (i)	Process Time (tijk) min.	Frequency Fijk
С	0.3	1	Load	1	4	1.0
		2	Drill	3	23	1.0
		3	Inspect	4	8	0.5
		4	Unload	1	2	1.0
D	0.4	1	Load	1	4	1.0
		2	Mill	2	30	1.0
		3	Inspect	4	12	0.333
		4	Unload	1	2	1.0

Table 4A: Process routings and part mix details

- **4B.** List the steps in king's algorithm used for identifying the part families. (03)
- 5A. What is the dividing line between station and server with respect to Bottle neck (02) model?
- **5B.** Design the ASRS system with the following requirements. In each aisle of an AS/RS, (08) there are 100 storage compartments in the length direction and 12 storage compartments vertically. The dimensions of the unit load in inches (in) are 50 (length), 45 (width) and 50 (height) respectively. The allowances designed for each storage compartment are x = 8 inch, y = 7 inch and z = 10 inch. Storage depth (u) in the number of unit load is 3. The average cycle time of operation of S/R machine is 1min. The system has a total number of storage space equal to 8000. The ASRS throughput expected is 15 operations/min. Take the maximum desired height 180m. Take center to center rack support as 0.10m. Bay side support allowance as 0.12m, clearance for the crane runout as 4.5m, clearance for pickup/deposit area as 5m. Aisle width as 1.5m. Also, Determine the capacity per aisle and the dimensions of the single storage system.
- **6A.** What are the different criteria applied for testing the flexibility of manufacturing cell? (05) Discuss in detail any four FMS layouts with neat diagrams.
- **6B.** Discuss various types of spindle bearing used in CNC and NC machines. (03)
- **6C.** List the different types of cutting tool used in NC machines. (02)