Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

I SEMESTER M.TECH. (INDUSTRIAL AUTOMATION AND ROBOTICS)

END SEMESTER EXAMINATIONS, NOV 2017

SUBJECT: AUTOMATED MANUFACTURING SYSTEMS [MTE 5133]

REVISED CREDIT SYSTEM
(21/11/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitable assumed.

1A. Enumerate the benefits of integrating computer into process planning. **(02)**

1B. A FMS can produce 3.6 parts per hour and it consists of 3 workstations, workstation 1 is Loading and Unloading station with 2 servers. Workstation 2 performs Threading operation and another workstation consists of 3 servers and performs drilling operation. The utilization of each station is 24%,100% and 48% respectively. The workload for 1st workstation is 8minutes, for second workstation it is 50 minutes and that of third workstation is 24 minutes. Calculate the number of servers in station 2. **(03)**

1C. Write a CNC program using word address format for the given profile in Fig Q1C. **(05)**

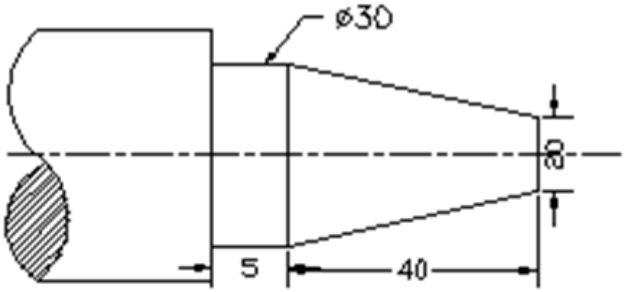

Fig Q1C: Machining Profile

2A. What is USA principle in Production system? **(02)**

2B. Process technologies differ in their flexibility capabilities and economics and will therefore be appropriate for different parts of the volume-variety matrix. Suggest manufacturing system that is ideal for mid volume – mid variety matrix. Justify your answer. **(03)**

2C. Justify the automation approach for the Die casting. Explain in detail the process of automating this casting process with the aid of a block diagram highlighting the components and technology used for automating this process. **(05)**

3A. What do you mean by Stick-slip phenomenon associated with friction guideways used in CNC machines? Suggest a remedial measure to overcome it. **(03)**

3B. Differentiate the types of FMS setups based on number of machines and highlight the characteristics of each type. **(03)**

3C. Describe the various architectures of distributed numerical control configuration. List an example for each of the configuration. **(04)**

4A. Elaborate on absolute and incremental coordinate systems. Which system is better? Justify your answer. **(04)**

4B. The AGVs includes load station 1 where raw parts enter the system for delivery to any of three production stations 2, 3, and 4. Unload station 5 receives finished parts from the production stations. Load and unload times at stations 1 and 5 are each 0.5 min. One Material flow loop completes, when vehicle completes the flow of 1-3-4-5 followed by 1-2-5. It is desired to determine how many vehicles are required to satisfy demand if a total of 40 del/hr must be completed by the AGVs. The following performance parameters are given: onward vehicle velocity= 50m/min, downward vehicle velocity = 60m/min, availability = 0.95, traffic factor = 0.90, and operator efficiency does not apply, so E = 1.0. Determine total cycle time per delivery as well as the number of vehicles required. All dimensions are in meters. **(06)**

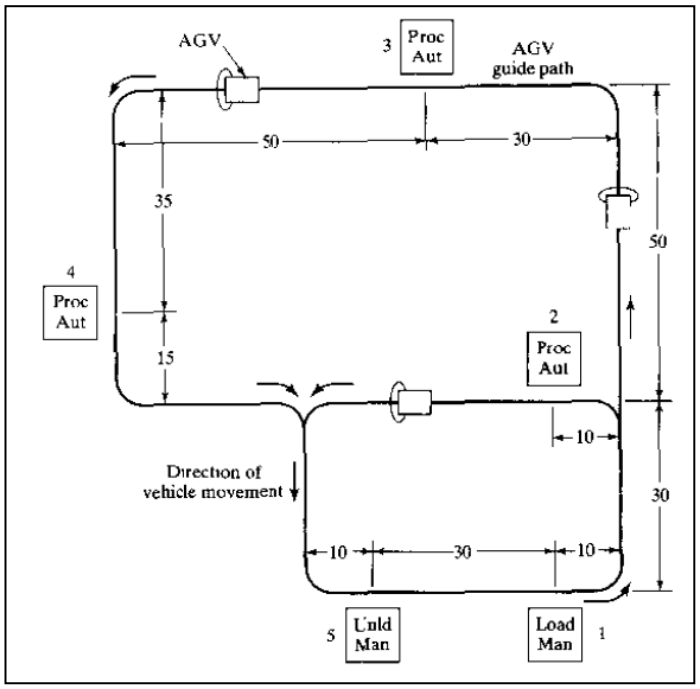

Fig Q4B: Layout for AGV movement.

5A. Design the ASRS system with following requirements. The unit load sizes are 0.6m width, 0.5m length, 0.5m height. The height and length is 0.20m and width clearance is 0.1m. The average cycle time of operation of the machine is 1m. The system has total number of storage space is 10000. The system throughput expected is 420 operations/hr. Desired system height to be less than 20m. Take Center-Center support height as 0.10m, Bay side support allowance as 0.10m, clearance for crane runout has 3m. Clearance for pickup/drop off area is 5m., aisle width as 2m and the number of unit load/storage is 4. **(05)**

5B. Comment on the different types of coding scheme structure used in Group Technology(GT) and explain in detail about the Optiz coding scheme. **(05)**

6A. Discuss the deterministic model used for quantitative analysis of FMS, emphasizing on its approximations. List its advantages and disadvantages. **(04)**

6B. Write a CNC program for the given profile for the depth of contour 5mm. Take suitable tool diameter. All dimensions are in mm. **(06)**

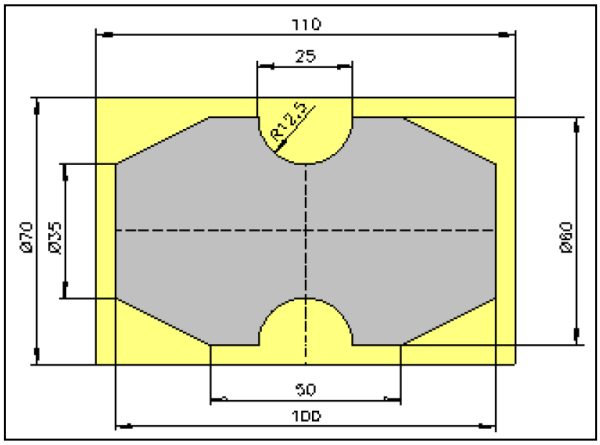

Fig Q6B: Contouring profile