

V SEMESTER B.TECH. (MECHATRONICS ENGINEERING) END SEMESTER EXAMINATIONS, NOV 2017

Reg. No.

SUBJECT: MANUFACTURING TECHNOLOGY [MTE 3101]

REVISED CREDIT SYSTEM (15/11/2017)

Time: 3 Hours

MANIPAL

A Constituent Institution of Manipal University

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL THE questions.
- ✤ Missing data may be suitably assumed.
- 1A. We know that pouring metal at a high rate into mold has certain disadvantages. Are (02) there any disadvantage(s) of pouring it very slowly?
- 1B. A FMS can produce 3.6 parts per hour and it consists of 3 workstations, workstation 1 (03) 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.
- List out the factors that influence the quality of Resistance Welding. Explain in detail (05) about the working principle of Resistance Spot Welding and discuss the advantages and disadvantages of the same.
- 2A. How polishing operation is different from buffing? (02)
- **2B.** What is the purpose of transducer and concentrator used in Ultra Sound (03) Machining(USM)? Describe about different types of concentrator.
- 2C. Describe the working principle of finishing process that uses bonded abrasive sticks (05) with the aid of neat sketch and justify its application in finishing the internal surfaces of IC engine, hydraulic cylinders, gas barrels, bearings etc.
- **3A.** What are the different types of Adaptive control(AC) systems used in CNC (05) machines? Enumerate the machining situations where adaptive control can be beneficially applied. Configure and explain suitable AC machining system for cutting a workpiece that has casting defect.

- **3B.** Apply the PFA method for the following part mix and machines to identify logical (05) part families and machine groups to derive the benefit of Group Technology. The part mix consists of 06 variants (Part A, Part B, Part C, Part D, Part E, and Part F). Machine 1 performs Milling, Machine 2 performs Drilling, Machine 3 Performs Turning, Machine 4 Performs Shaping, Machine 5 Performs Grinding and whereas Machine 6 performs Honing. Part A is manufactured by Milling and Turning operations, Part B is manufactured by Turning and Grinding processes, Part C is manufactured by shaping and honing processes part D requires Drilling, Shaping, and Honing operations, Part E requires Milling and Grinding, whereas Part F is manufactured out of Drilling and Honing processes.
- 4A. As a part of his project work, Rijul has decided to carry out the various milling (06) operations on an Aluminum billet of size 100X100X10 mm (Fig Q4A.) using CNC machine, for all the operations he is using STDRILL tool of 4mm dia (T03). The sequence of operations he will be following are (i). Circular Pocketing, (ii). Rectangular slot of depth 2 mm and (iii). Through slot operation. He has restricted maximum depth of cut in a pass to 2 mm. Help him by writing the CNC programming for the same, using word address format.



Fig Q4A: CNC Milling, Billet Dimension (100X100X10) mm

- **4B.** What are the different criteria applied for testing the flexibility of manufacturing cell? **(04)** Discuss in detail any four FMS layouts with neat diagrams.
- 5A. Write a CNC program using word address format for the profile shown in Fig Q5A. (05)



Fig Q5A: CNC Turning profile

5B. The warehouse layout of an Ecommerce enterprise is shown in Fig.Q5B. The material (05) transport vehicles travel in a shown direction around the loop to deliver loads from the load station to the unload station. Loading time at the load station = 5.5 min, and unloading time at the unload station = 3.2 min. It is desired to determine how many vehicles are required to satisfy demand for this layout if a total of 25del/hr must be completed by the vehicles. Site 1 is ASRS system used for loading and unloading the components. Site 2, 3 and 4 are for packaging and sorting.

Calculate the total travel distance and empty distance for the sequence of i) 5 times 1-2-1, ii)2 times 1-2-4-1, and iii)1 time 1-2-3-1. The following performance parameters are given: vehicle velocity= 50m/min, availability = 0.92, traffic factor = 0.85, and E = 0.90 also Determine: (a) travel distances loaded and empty, (b) ideal delivery cycle time, and (c) number of vehicles required to satisfy the delivery demand.



Fig. Q5B: Warehouse layout map (All distances are in meters)