

Automation and Computerized Manufacturing (ME-703)

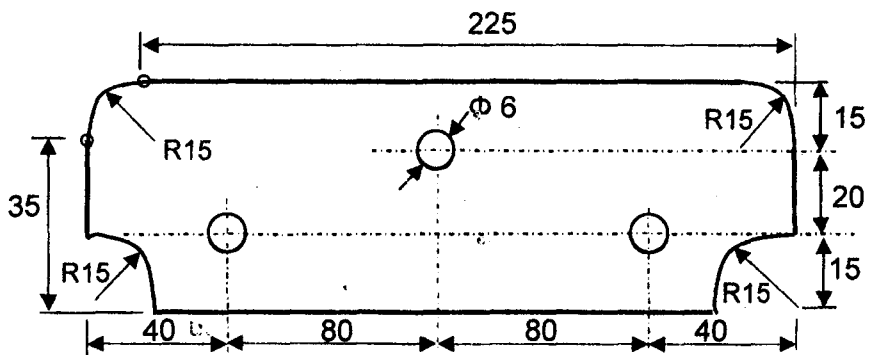
Full Marks: 70

Time: 3 hrs

Use separate answer script for each half.
 Answer SIX questions, taking THREE from each half.
 All questions carry equal marks.

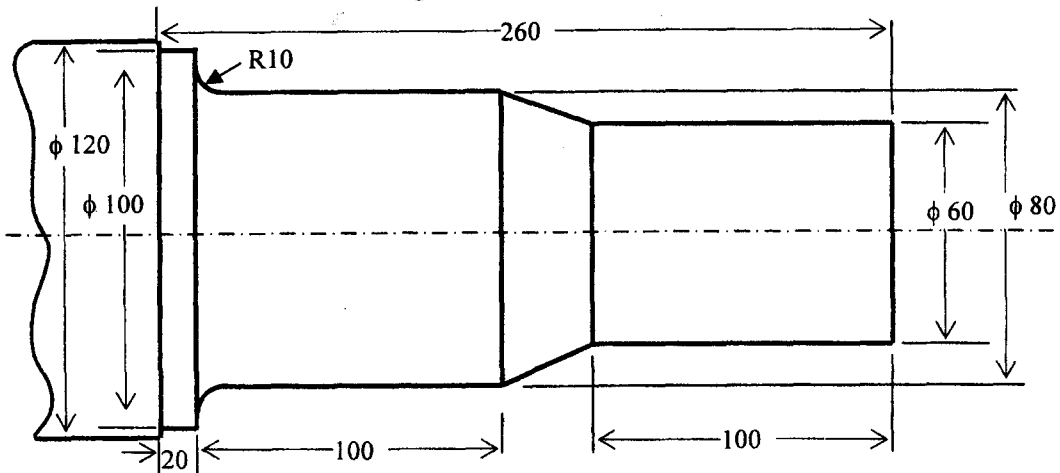
FIRST HALF

- What are the main differences of capstan and turret lathes?
 Define Numerical Control (NC).
 What are the differences between single spindle and multi spindle bar machines?
- How 'closed loop control' is different from 'open loop control'? Explain with reference to numerical control of tool-work motions in machine tools.
 Write a short note on the CNC machine movements.
 Write a short note on the characteristics of machining centers.
- Write notes on G and M functions for CNC part programming.
 Explain tool path compensation in CNC machining with suitable examples.
 Explain circular interpolation in CNC machining with suitable example.
- Prepare the CNC part program with suitable description for machining of a plate for the following configuration:



All dimensions are in mm unless otherwise specified.

- Write a CNC part program with suitable description for turning a bar of 300 mm length and 120 mm diameter in a turning centre for the following configuration:



All dimensions are in mm unless otherwise specified.

Second Half

6. (a) Why hobbing is termed as the 'process of generation'?
- (b) In a gear hobbing operation, the hob is single start and rotated at 100 rpm and the gear to be cut is 48 teeth, normal module 2 and lead 1000 mm. The number of teeth of the gear fitted in the hob cutter axis is 46 and its corresponding matching gear is 20, the transformation constant of the differential is 0.5. The feed is to be 0.12 mm/rev of the gear blank and the pitch of the screw thread is 12 mm. The worms are double-start and the worm wheels fitted in the gear blank axis and the feed change gear box are 69 teeth and 40 teeth, respectively. The RPM of the driving motor is 1450. If the reduction ratio is 1 in 100 along the feed line, find the speed change gear and feed change gear ratio and the number of teeth of the corresponding mating gears.
7. (a) Compare between spur and helical gear hobbing. Write the advantages and limitations of gear hobbing process and compare the same with milling process. Write the sequence of operations followed for manufacturing a complete gear product.
- (b) Draw the kinematics diagram and write the kinematics equation of feed change gear.
8. (a) Compare conventional material handling systems with automated material handling system.
- (b) Determine the number of vehicles required to satisfy demand for a particular automated guided vehicles system. Loads are picked up by the vehicles automatically at the load station and delivered to the unload station for drop-off. The system must be capable of making 50 deliveries per hour. The average travel distance per delivery is 600 m and the empty travel distance is 350 m. The load and unload times are both 1.2 minute and the speed of the vehicle is 60 m/min. The traffic factor for the system is 0.85. Find the handling system efficiency. Draw the layout diagram of the system.
9. (a) Define CIM and its advantages and limitations. Describe the different types of manufacturing systems.
- (b) What is FMS? Write the various components of FMS. For what type of production system FMS is most appropriate. Write few applications of FMS in manufacturing.
10. Write short notes in the followings:
- (a) Conveyor
- (b) FMS workstations
- (c) Industrial robot