

(3 Hours)

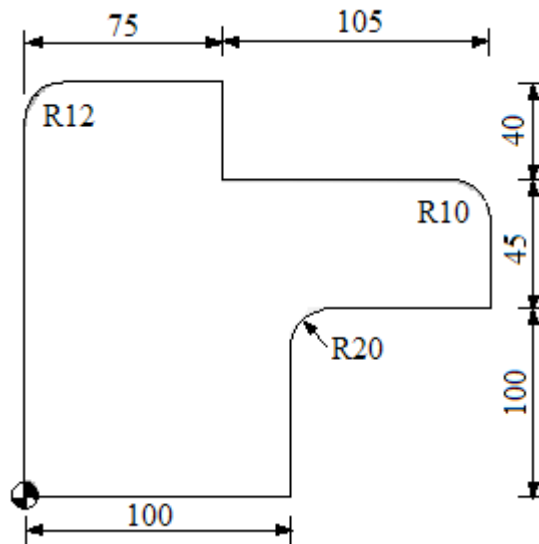
[Total Marks : 80

N.B. (1) Question no. 1 is compulsory.

(2) Attempt any **three** questions out of remaining **five** questions.(3) **Illustrate** your answer with **necessary** sketch wherever **necessary**.(4) **Figures** to the **right** indicate full **marks**.

1. Attempt any FOUR of the following : (20)
 - (a) What are various G and M codes in CNC machines?
 - (b) Describe various types of chips.
 - (c) State any two requirements of a dynamometer and explain any one dynamometer.
 - (d) State the factors for selection of grinding wheel.
 - (e) What are the assumptions made in Merchant's circle diagram.
2. (a) Design a circular form tool to cut a semi-circular groove in the radial plane of a cylindrical component. Select proper rake and clearance angle. (10)

(b) Discuss various cutting tool materials with their properties and applications. (10)
3. (a) Write a manual part program for machining external contour as shown in the figure. Use a 6 mm diameter end mill. The part depth is 3 mm. Take Z-reference 5 mm above the top surface of the component. Ignore cutter radius compensation. (10)



- (b) Write the various steps in design of broach tool (10)
4. (a) What are the functions of cutting fluid? Discuss different types of cutting fluids. (10)

(b) While machining steel with a tool of [0-10-6-6-75-1] ORS shape following observations were made.

(i) Spindle speed 400 rpm	(ii) Work diameter 60 mm
(iii) Depth of cut 2.5 mm	(iv) Tool feed rate 80mm/min

(v) Cut chip thickness 0.40 mm

Determine chip thickness ratio, shear plane angle, dynamic shear and theoretical continuous chip length per minute.

5. (a) Derive an expression for optimum cutting speed and tool life for both minimum production cost and maximum production rate during machining process. (10)
- (b) Describe the working of universal milling machine with suitable sketch. (6)
- (c) State the effect of following on a cutting tool strength: (4)
 - i) Positive Rake angle ii) Zero Rake angle iii) Negative Rake angle
6. Write short notes on any **FOUR** : (20)
 - (a) Gear finishing process.
 - (b) Machinability
 - (c) Gear machining process
 - (d) Defects in grinding.
 - (e) ASA system of tool designation.