

# BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE PILANI

Second Semester 2022-23

Computer Aided Design and Manufacturing (MF F317)

Comprehensive Examination (Regular, Closed Book)

Date: 13-05-2023

Maximum Time: 180 min.

Maximum Marks: 80

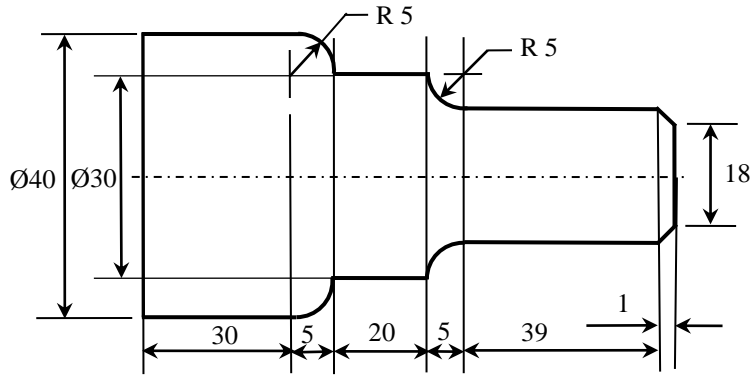
*Note: Be succinct, no credit will be given for ambiguous answers. All parts of a question must be answered together and in sequence. Answer of a question must be started from a fresh page.*

## Q1.

- a) Write down **only two major** differences in **tabular form**. [10]  
i) Feed override vs. Speed override ii) Tool probe vs. Spindle probe iii) Machining center vs. Turning center iv) Point to point control vs. Contouring control v) Machine coordinate vs. Part coordinate.
- b) Write down your answer **briefly (not more than two sentences)**. [15]  
i) How is constant cutting speed maintained in turning center? Explain it with proper sketch.  
ii) What is canned cycle in CNC part programming? What advantages will you expect from the use of canned cycle during CNC machining?  
iii) What is work offset in CNC milling?  
iv) Write down the drawbacks of Bezier curve over B-spline curve.  
v) What advantages will you expect from CNC turn mill center over the CNC lathe?
- c) Describe the following CNC terminologies **with proper sketch**. [15]  
i) Turning tool nose orientation  
ii) Ramp ON and OFF move  
iii) Incremental encoder  
iv) Tool length compensation in CNC milling  
v) Axis system for double turret turning center

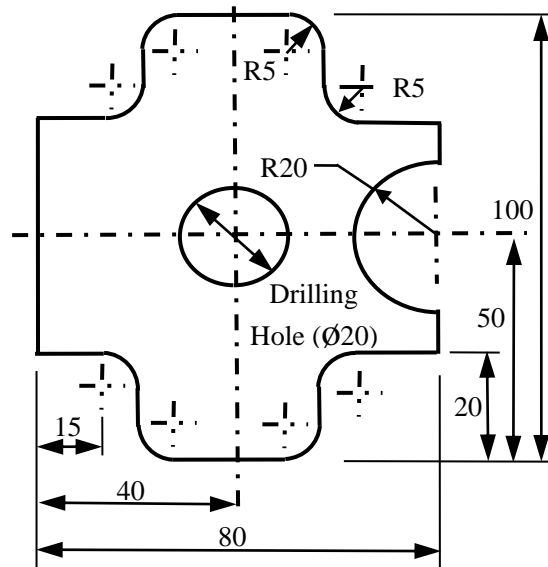
## Q2.

- a) Find the parametric equation of the cylinder which is defined by a half circle. The center coordinate (X,Y) of the circle is (5,6) and radius value is 20 mm. The axis of the cylinder is in the  $-Z$  direction and is 50 mm long. In addition, determine the point at  $t = 0.5$ ,  $s = 0.5$  on the cylindrical surface generated by the half circle with proper sketch. [10]
- b) A machined component as shown in Fig.1 is produced in CNC lathe from a cylindrical raw stock having initial diameter 42 mm and length 100 mm. During machining operation, feed rate and spindle speed are selected 120 mm/min and 1200 rpm respectively. Write CNC part program **manually** for **roughing** and **finishing** cycles by mentioning proper program zero. The maximum depth of cut in any pass of the roughing and finishing cycles is restricted to 2 mm. Consider zero nose radius of turning insert used for the operation. Assume any other parameters if required. [15]



**Fig.1: Geometry of Final Component**

- c) Write a CNC part program manually without using radius compensation for manufacturing of aluminium component shown in Fig.2 from a given rectangular plate with dimension of 100mm×80mm×10mm. An end mill cutter (HSS) of 6 mm diameter and a twist drilling (HSS) of 20 mm diameter are used for machining operations. The effective cutting edge length of end mill cutter and tool overhang are 20 mm and 50 mm respectively. Step over distance is recommended as half of the tool diameter. During milling, feed rate and spindle rpm chosen are 80 mm/min and 1000 respectively. For performing the drilling operation, feed rate and spindle rpm is 30 mm/min. and 200 respectively. Assume any other parameters if required. [15]



**Fig.2: Part Drawing of Aluminium Component**

\*\*\*\*\**Best of luck*\*\*\*\*\*