



22.

**Answer All the Following Questions**

**Q(1) (15 Marks)**

Write the part program for the part shown in Figure (1) for CNC vertical milling machine tool, illustrating the meaning of each step. Depth of cut is 5.0 mm. The coordinates of the points are given in Table (1). Assume any missing data.

**Q(2) (15 Marks)**

Write the part program for the part shown in Figure (2) for CNC lathe machine tool, illustrating the meaning of each step. Assume any missing data.

**Q(3) (40 Marks)**

- a) In an NC drilling operation, six holes must be drilled in sequence at the following coordinate location:

Hole #1	X = 14.500	Y = 10.000	Hole #4	X = 16.000	Y = 17.000
Hole #2	X = 15.000	Y = 10.000	Hole #5	X = 20.000	Y = 25.000
Hole #3	X = 15.000	Y = 17.000	Hole #6	X = 30.000	Y = 30.000

No preparatory or miscellaneous words are required, tooling is changed manually, so no T word required. The holes are to be drilled to 18 mm diameter at 2000 r.p.m and 0.4 surface mm/ rev. Write the three instruction blocks in each of the three tape formats. (10)

- b) Compare between open-loop servo drives & closed-loop servo drives. (5)
- c) Explain the relationship of I & J modifiers to X & Y axes and define I, J, & K modifiers, give an example to illustrate your answer. (4)
- d) There are four statements in the APT language, describe them in detail. Illustrate your answer with different examples. (12)
- e) Define in detail each of the following:  
1. Zero point location 2. Set-up point 3. Fixed zero 4. Floating Zero 5. NC tape (5)
- f) For what purpose are linear & circular interpolation used? (4)

**Wishing the best of luck for all of you**  
*Prof. Dr. Tawfik Tawfik El-Midany*

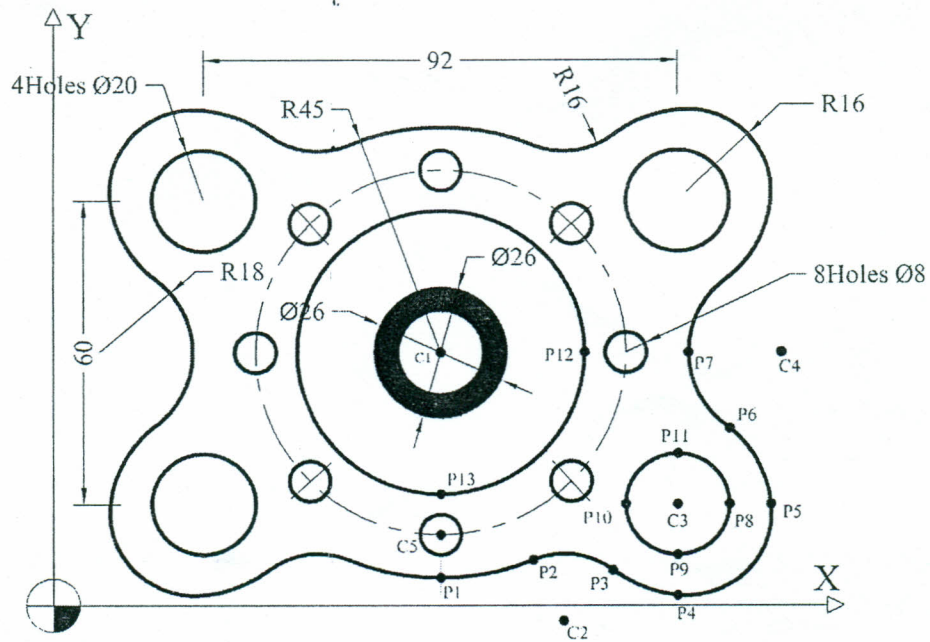


Figure (1)

Point	Coordinates	Point	Coordinates	Point	Coordinates
P1	( 75 , 5 )	C1	( 75 , 50 )	P7	( 123 , 50 )
P2	( 93 , 9 )	C2	( 99 , -3 )	P8	( 131 , 20 )
P3	( 108.5 , 7 )	C3	( 121 , 20 )	P9	( 121 , 10 )
P4	( 121 , 2 )	C4	( 141 , 50 )	P10	( 111 , 20 )
P5	( 139 , 20 )	C5	( 75 , 14 )	P11	( 121 , 30 )
P6	( 131 , 35 )	P12	( 103 , 50 )	P13	( 75 , 22 )

Table (1)

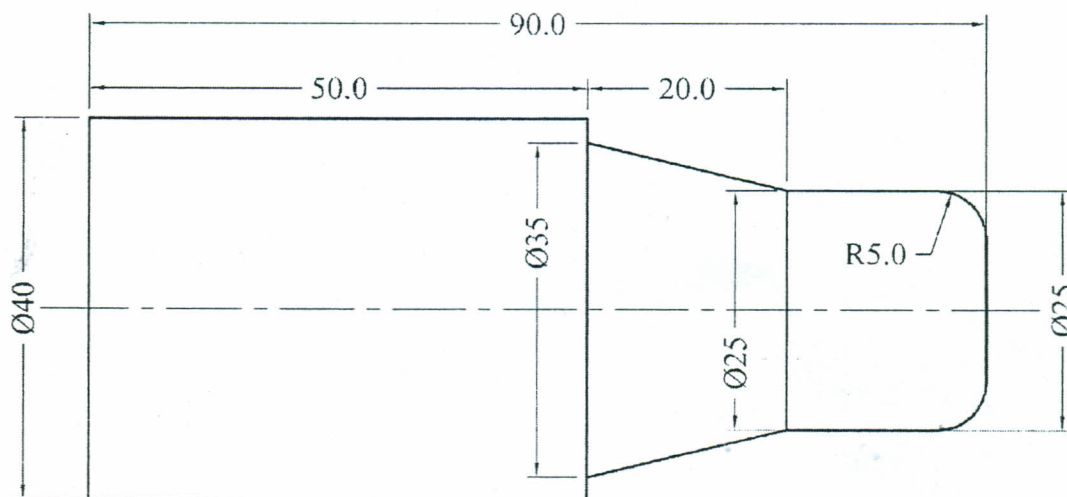


Figure (2)