Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, MAY / JUNE 2024

B.E. (Manufacturing Engineering)

Semester VI

MF5601 - CNC MACHINE TOOLS

(Regulations 2019)

Time:3 hrs

Max. Marks: 100

CO1	To introduce the evolution, types and principles of CNC machine tools
CO2	To familiarize the students with constructional features of CNC machine tools
CO3	To acquaint the students with various drives and axis measuring systems used in CNC machine tools
CO4	To gain knowledge on manual part program and generation of CNC part program using CAM packages
CO5	To familiarize the students with various tooling and work holding devices used in CNC machine tools

BL – Bloom's Taxonomy Levels

(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A (10x2=20Marks)

(Answer all Questions)

Q.No	Questions	Marks	CO	BL
1	State any four CNC controllers.	2	1	L1
2	Propose suitable machine tool for turning large and heavy workpieces, and could you explain why this choice is justified?	2	1	L5
3	Examine why slant bed is preferred in CNC lathe?	2	2	L3
4	How can you improve the stability of a ball screw utilized in CNC machine tools? State its advantages.	2	2	L4
5	State true or false. Stepper can be effectively used in CNC machining centre.	2	3	L4
6	Make a critical comparison between encoder and laser interferometer for axis measurement in CNC machine tool.	2	3	L4
7	State the functions of following G and M code. G02 G04 M04 M30	2	4	L1
8	State true or false. Tool nose radius compensation need not be given for precision turning operation. Justify.	2	4	L4
9	Interpret the following ISO coding system of carbide inserts used in CNC turning centre? "TNGG220404"	2	5	L6
10	State any four factors influencing selection of CNC machine.	2	5	L1

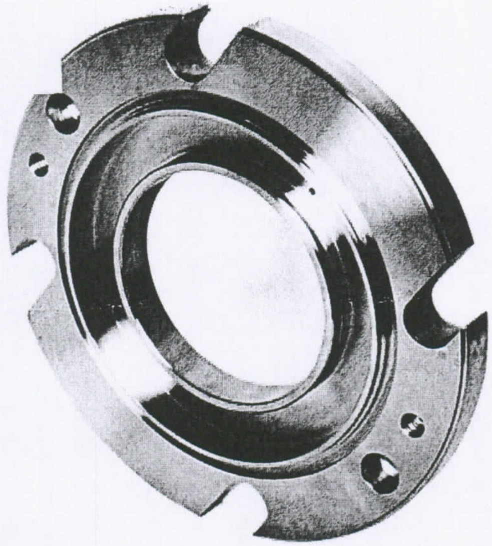
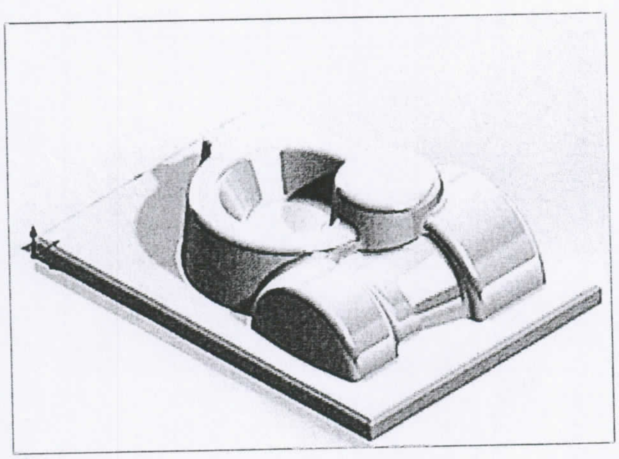
PART- B (5x 13= 65Marks)

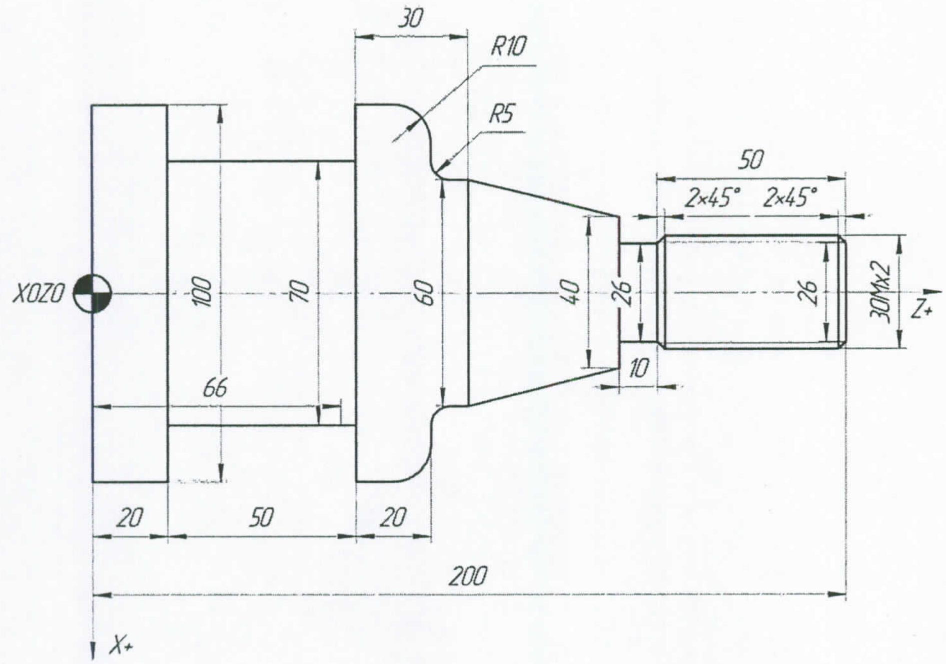
(Restrict to a maximum of 2 subdivisions)

Q. No	Questions	Marks	CO	BL
11 (a)	Enumerate the salient features of CNC machining centre and CNC turn-mill centre.	13	1	L1
	OR			
11 (b)	Describe the classification of CNC machine tools based on tool motion and control system.	13	1	L1
12 (a)	What is meant by stick-slip phenomenon? Describe with neat sketches working principle of any two methods used to overcome stick-slip.	13	2	L3
	OR			
12 (b)	Illustrate with neat sketches salient features of any two torque transmission elements used in CNC machine tool.	13	2	L3
13 (a) (i)	A stepper motor has 400 step angles. Its output shaft is directly coupled with to a ball-screw with pitch = 6 mm. The worktable of a positioning system is driven by the ball-screw. The table must move a distance of 100 mm from its current position at a travel speed of 150 mm/min. Determine how many pulses are required to move the table to the specified distance? What is the required motor speed and pulse rate to achieve the table speed?	4 4	3	L3
(ii)	Make a critical comparison between ball screw and linear motor.	5		
13 (b)	Demonstrate the working principle of angular gratings and linear inductosyn for axis measurement in CNC machine tool.	13	3	L3
14 (a)	Prepare CNC part program for the component shown in Fig Q. 14 a). Mention the assumptions made.	13	4	L4
	OR			
14 (b) (i)	Prepare CNC part program for the component shown in Fig Q. 14 b). Mention the assumptions made.	13	4	L4
15 (a)	List out any four requirements of cutting tool materials. Discuss the features of any three cutting tool materials used in CNC machine tools.	13	5	L1
	OR			
15 (b)	Describe with neat sketches working principle of collet chuck and modular fixture.	13	5	L1

PART- C(1x 15=15Marks)

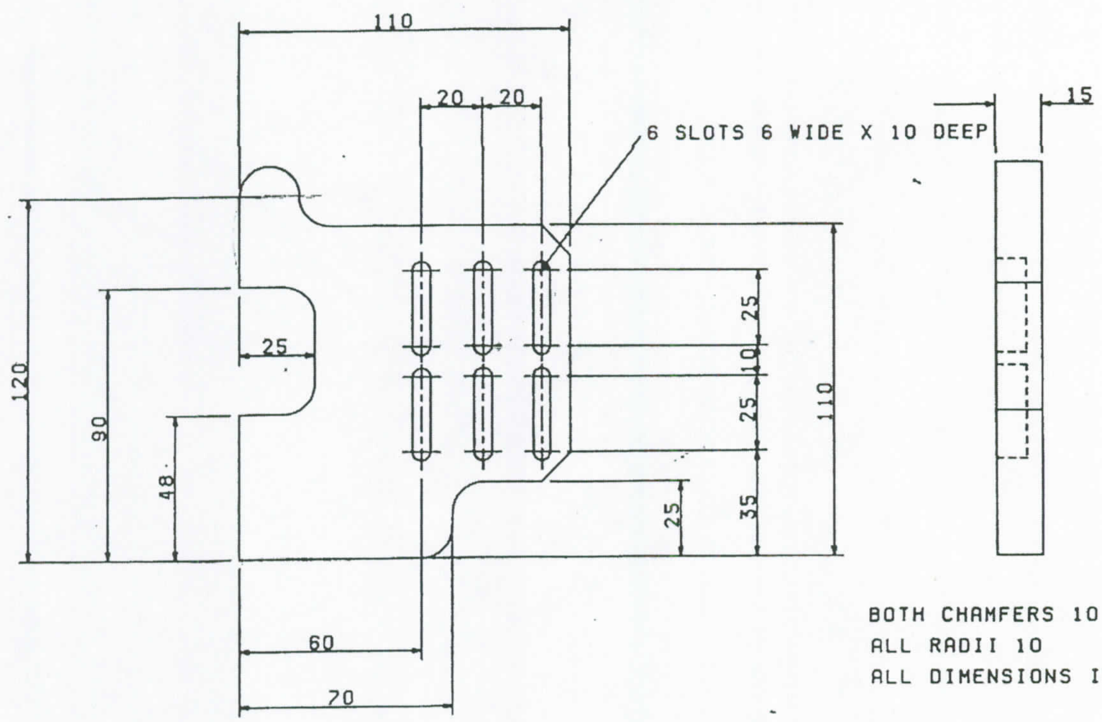
(Q.No.16 is compulsory)

Q.No	Questions	Marks	CO	BL
16.	i) Identify the correct CNC machine tool for machining the component shown in Fig Q. 16 i) & Fig 16 ii) and justify your answer.  Fig Q. 16 i)  Fig 16 ii)	10	1	L5
	ii) Compare qualified and semi-qualified tooling.	5	5	L5



All Dimensions are in mm

Fig Q. 14 a)



BOTH CHAMFERS 10 x 45°
ALL RADII 10
ALL DIMENSIONS IN MM

Fig Q. 14 b)