SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603203

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

IV SEMESTER

ME 3462 MANUFACTURING TECHNOLOGY

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Prepared by

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SUBJECT CODE / NAME : ME3462 / MANUFACTURING TECHNOLOGY

SEMESTER / YEAR : IV SEMESTER / II YEAR

UNIT-I: FUNDAMENTALS OF MACHINING

Introduction: Material removal processes, types of machine tools; Metal cutting fundamentals: Theory of chip formation, types of chips, Piispanen model of card analogy, orthogonal cutting and oblique cutting; Nomenclature of single point cutting tools; Mechanics of metal cutting: Machining forces and Merchant's Circle Diagram (MCD) – simple calculations, cutting tool materials, tool wear, tool life, surface finish, cutting fluids; Overview of high speed machining.

PART – A (2 MARKS)

Sl.No	QUESTIONS	LEVEL	COMPETENCE
1	Define machining process.	BTL1	Remember
2	Classify metal cutting processes.	BTL1	Remember
3	Differentiate orthogonal cutting and oblique cutting.	BTL2	Understand
4	Mention the various parts of the single point cutting tool.	BTL1	Remember
5	Define chip thickness ratio.	BTL1	Remember
6	Define high speed machining.	BTL2	Understand
7	What is cutting force?	BTL2	Understand
8	What is chip reduction co-efficient?	BTL2	Understand
9	Write two examples of orthogonal cutting.	BTL1	Remember
10	What are the types of chips?	BTL1	Remember
11	What is a shear angle?	BTL1	Remember
12	When will negative rake angles be used?	BTL2	Understand
16	What is the clearance angle?	BTL1	Remember
14	What is a tool signature?	BTL1	Remember
15	Discuss various types of chip breakers.	BTL1	Remember
16	Mention the cutting forces acting on the cutting tool.	BTL1	Remember

17	Mention the assumptions followed in Merchant's circle.	BTL1	Remember
18	List out the reasons for poor surface finish in cutting.	BTL1	Remember
19	What is the machinability index?	BTL1	Remember
20	Write the factors that affect the tool life.	BTL1	Remember
21	List out various cutting tool materials.	BTL1	Remember
22	Describe the essential characteristics of cutting fluid.	BTL1	Remember
23	Point out the causes of wear.	BTL1	Remember
24	Why is lubrication not required while machining cast iron?	BTL2	Understand
25	Write Taylor's tool life equation	BTL1	Remember

PART – B (16 MARKS)

SL.NO	QUESTIONS	MARKS	LEVEL	COMPETENCE
1	a) Explain various classifications of machine tools. b) Describe the mechanism of metal cutting.	(8) (8)	BTL4	Analyze
2	What is orthogonal rake system? Show the ORS of tool analysis with the help of a sketch.	(16)	BTL4	Analyze
3	Explain Nomenclature of a single point cutting tool with neat sketches.	(16)	BTL4	Analyze
4	a) Explain the "Merchant force circle" along with assumptions. b) Using Merchant's circle diagram, derive the expression for estimating the cutting force during machining.	(8) (8)	BTL4	Analyze
5	The following data from an orthogonal cutting test is available Rake angle = 15^O Chip thickness ratio = 0.383 Uncut chip thickness = 0.5 mm Width of cut, b = 3 mm Yield stress of material in shear = 280 N/mm² Average coefficient of friction on the tool face = 0.7. Determine the normal and tangential forces on the tool face.	(16)	BTL4	Analyze
6	Describe an expression for the determination of shear angle in orthogonal metal cutting.	(16)	BTL3	Apply

7	The following data relate to an orthogonal turning process: Chip thickness= 0.62 mm, Feed= 0.2 mm/rev Rake angle = 15^{O} (i) Calculate cutting ratio and chip reduction co-efficient. (ii)Calculate shear angle (iii)Calculate the dynamic shear strain involved in the deformation process.	 (6) (6) (4)	BTL4	Analyze
8	Analyze the forms of wear on the cutting tool with neat sketches.	(16)	BTL4	Analyze
9	a) Mention the functions of cutting fluids. b) Explain the uses of Cutting Fluids.	(8) (8)	BTL4	Analyze
10	Explain various types of chips produced during metal machining with neat diagrams.	(16)	BTL4	Analyze
11	Explain the essential requirements and properties of a tool material.	(16)	BTL4	Analyze
12	Briefly explain about the popular metal cutting theories. a) Modified Merchant Theory b) Lee and Shaffer's Theory	 (8) (8)	BTL4	Analyze
16	What is the use of chip breaker? Explain various types of chip breakers with neat sketches.	(16)	BTL4	Analyze
14	Briefly explain the following with neat sketches: a) Orthogonal Cutting b) Oblique Cutting	 (8) (8)	BTL4	Analyze
15	Explain various tool materials.	(16)	BTL4	Analyze
16	What is machinability? And explain in detail.	(16)	BTL4	Analyze
17	Explain the parameters which affect surface finish.	(16)	BTL4	Analyze
18	What is the tool life equation? and explain the factor affecting the tool life.	(16)	BTL4	Analyze

UNIT-II: CENTRE LATHE AND SPECIAL PURPOSE LATHES

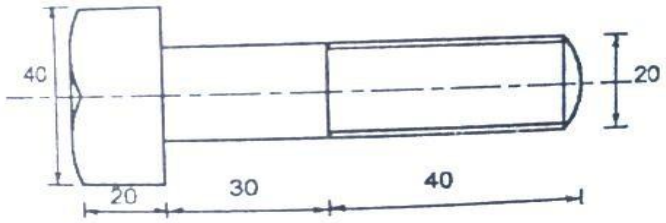
Centre lathe, constructional features, various operations, taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes – Automats – Single spindle, Swiss type, multi spindle - Turret Indexing mechanism, Bar feed mechanism.

PART – A (2 MARKS)

Sl.No	QUESTIONS	LEVEL	COMPETENCE
1.	List the operations that can be performed on a lathe.	BTL1	Remember
2.	Name any four work holding devices.	BTL1	Remember
3.	State the various parts mounted on the carriage.	BTL2	Understand
4.	How power is estimated?	BTL2	Understand
5.	List the functions of feed rod and lead screw.	BTL1	Remember
6.	Differentiate live centre and dead centre.	BTL2	Understand
7.	What is swing diameter?	BTL1	Remember
8.	Mention various thread cutting methods.	BTL1	Remember
9.	Define the term “Thread catching”.	BTL1	Remember
10.	Define the term “Conicity”.	BTL1	Remember
11.	List any four lathe accessories.	BTL1	Remember
12.	What are the uses of head stock?	BTL1	Remember
16.	Define machining time.	BTL1	Remember
14.	Differentiate capstan and turret lathe.	BTL2	Understand
15.	Mention the need for automatic lathes.	BTL2	Understand
16.	State the purpose of the tumbler gear mechanism.	BTL2	Understand
17.	List the three stages of a tool layout.	BTL1	Remember
18.	What are the advantages of automatic lathes?	BTL1	Remember
19.	Mention the applications of a copying lathe.	BTL1	Remember
20.	Define automatic machine.	BTL1	Remember
21	How machining holes are cut in automatic cutting off machine?	BTL2	Understand
22	State the advantages of Swiss type screw cutting machine.	BTL1	Remember
23	Compare the parallel action and progressive action multi spindle automatic lathes.	BTL2	Understand
24	Classify multi spindle automats.	BTL1	Remember
25	State the principle of multi spindle automats.	BTL1	Remember

PART – B (16 MARKS)

SL. NO	QUESTIONS	MARKS	LEVEL	COMPETENCE
1	Explain the construction and working principle of a lathe with sketch.	(16)	BTL4	Analyze
2	What is a lathe carriage? Explain the various parts of a lathe carriage with a neat diagram.	(16)	BTL4	Analyze
3	Discuss any four work holding devices in a lathe with neat sketches.	(16)	BTL4	Analyze
4	Explain any four tool holding devices in a lathe with neat sketches.	(16)	BTL4	Analyze
5	Explain various types of taper turning methods with neat sketches	(16)	BTL4	Analyze
6	Discuss various types of thread cutting operations.	(16)	BTL4	Analyze
7	Briefly explain the following feed mechanism: a) Tumbler gear reversing mechanism. b) Quick-change gear box.	 (8) (8)	BTL4	Analyze
8	Explain the purpose of various attachments used on a centre lathe with neat sketches.	(16)	BTL4	Analyze
9	Calculate the gears for cutting metric threads of the following pitches. a) 4 mm pitch (ii) 5.25 mm pitch. The lead screw of the lathe contains 6 TPI. The lathe is supplied with 20 to 120 teeth in steps of 5 and an additional gear wheel has 127 teeth. b) The pitch of the lead screw of a lathe is 6 mm. If the pitch of the thread to be cut is 1.5 mm, find the change gear wheels. Available gear wheels are 20 to 120 in steps of 5. Draw a sketch showing the gear arrangement.	 (8) (8)	BTL4	Analyze
10	Explain the main parts of a turret lathe with neat sketch.	(16)	BTL4	Analyze
11	Explain the working principle of turret lathe.	(16)	BTL4	Analyze
12	Explain the tooling layout for the production of a Hexagonal bolt in a capstan lathe.	(16)	BTL4	Analyze

16	Write down the differences between a capstan and a turret lathe.	(16)	BTL3	Apply
14	Explain the following with suitable sketches. a) Geneva mechanism b) Bar feeding mechanism	 (9) (7)	BTL4	Analyze
15	Briefly explain the tool layout for the square headed bolt from a square bar stock using a turret lathe shown in figure (i)  Figure (i)	(16)	BTL5	Evaluate
16	Discuss about the single spindle automatic lathe and explain Swiss type automatic lathe.	(16)	BTL4	Analyze
17	Explain multi-spindle automatic lathe.	(16)	BTL4	Analyze
18	Explain about the progressive action multi spindle automats with neat sketch.	(16)	BTL4	Analyze

UNIT-III: MACHINE TOOLS FOR NON-CIRCULAR COMPONENTS AND HOLE MAKING			
Reciprocating machine tools: shaper, planer, slotter (Construction details only). Milling machines: Horizontal milling m/c and Vertical milling m/c: specifications, parts, milling cutters, work holding devices, operations. Hole making: Drilling, reaming, boring, tapping - sawing machine: hack saw, band saw, circular saw; broaching machines: Push, pull, surface and continuous broaching machines – broach construction.			
PART – A (2 MARKS)			
Sl.No	**QUESTIONS**	**LEVEL**	**COMPETENCE**
1.	Define Shaper.	BTL1	Remember
2.	What are the differences between drilling and reaming?	BTL2	Understand
3.	Briefly describe the importance of the quill mechanism	BTL1	Remember
4.	List the types of sawing machines.	BTL1	Remember
5.	Compare hydraulic shaper with mechanical shaper.	BTL3	Apply
6.	Write down any four operations performed by a shaper.	BTL1	Remember
7.	Differentiate up milling and down milling.	BTL3	Apply
8.	What is a shell mill?	BTL2	Understand
9.	How do you classify milling cutters?	BTL1	Remember
10.	What do you know about straight fluted drill and fluted drill?	BTL1	Remember
11.	Mention any four shaper specifications.	BTL1	Remember
12.	What are the specifications of the milling machine?	BTL2	Understand
16.	Define “Face milling”.	BTL1	Remember
14.	Write down the rule for gear ratio in differential indexing.	BTL1	Remember
15.	Write the differences between drilling and tapping.	BTL1	Remember
16.	Write down the rule for gear ratio in differential indexing.	BTL1	Remember
17.	Define the cutting speed, feed.	BTL1	Remember
18.	What is meant by “sensitive hand feed”?	BTL2	Understand
19.	List out the various elements of a plain milling cutter with a neat sketch.	BTL1	Remember
20.	Compare gear forming with gear generation method.	BTL2	Understand
21	List out the gear finishing processes.	BTL1	Remember
22	Define gear hobbing.	BTL1	Remember
23	What are the limitations of gear hobbing?	BTL2	Understand
24	Mention two advantages of gear hobbing.	BTL1	Remember

25	What is the main disadvantages of gear shaping?	BTL2	Understand

PART – B (16 MARKS)

SL. NO	QUESTIONS	MARKS	LEVEL	COMPETENCE
1	Explain the principle of operation of a shaper with a neat sketch.	(16)	BTL5	Evaluate
2	Explain the hydraulic drive mechanism of a horizontal shaper with a neat sketch.	(16)	BTL5	Evaluate
3	Explain the whitworth quick return mechanism with a neat sketch.	(16)	BTL5	Evaluate
4	Sketch and explain the working principle of an upright drilling machine.	(16)	BTL4	Analyze
5	Discuss the various operations performed in drilling machines.	(16)	BTL4	Analyze
6	Explain the twist drill nomenclature and define various elements of twist drill.	(16)	BTL4	Analyze
7	Describe the working of a crank and slotted link quick return shaper mechanism.	(16)	BTL4	Analyze
8	a) With neat sketches, explain the working of a vertical boring machine. b) Explain the twist drill nomenclature and define various elements of twist drill..	(9) (7)	BTL4	Analyze
9	a) With a neat sketch, describe the working principle of a jig boring machine. b) Describe the horizontal knee type milling machine with a suitable sketch.	(9) (7)	BTL4	Analyze
10	Sketch and describe the basic types of milling cutter.	(16)	BTL4	Analyze
11	Describe the working mechanism of a universal dividing head, with neat diagrams.	(16)	BTL4	Analyze
12	a) Explain the gear cutting by a formed tool. b)Describe gear cutting by shaping and list the advantages and disadvantages of gear shaping process.	(6) (10)	BTL5	Evaluate
16	Describe the various types of milling operations.	(16)	BTL4	Analyze
14	Explain the principle of operation of gear hobbing operation.	(16)	BTL5	Evaluate

15	Explain the gear shaving process.	(16)	BTL5	Evaluate
16	a) List out various methods used for gear finishing and explain any four methods. b) Enumerate the advantages and limitations of gear finishing.	(10) (6)	BTL4	Analyze
17	Describe the working mechanism of a universal dividing head, with neat diagrams.	(16)	BTL4	Analyze
18	Explain simple indexing, compound indexing and differential indexing with suitable example.	(16)	BTL5	Evaluate

UNIT-IV: GEAR MANUFACTURING AND SURFACE FINISHING PROCESSES			
Gear machining: Forming, Gear generating process – Gear shaping, Gear hobbing. Surface finishing- Abrasive processes: Types of grinding process –cylindrical grinding, surface grinding, centre less grinding – grinding wheel specifications and selection. Fine finishing processes – Honing, lapping, super finishing, polishing and buffing, power brushing-Tumbling - Metal spraying –Metallization.			
PART – A (2 MARKS)			
Sl.No	**QUESTIONS**	**LEVEL**	**COMPETENCE**
1.	What is meant by loading of grinding wheels?	BTL2	Understand
2.	Write the specifications of a grinding machine.	BTL1	Remember
3.	Define surface integrity.	BTL1	Remember
4.	What is the process of self-sharpening of the grinding wheel.	BTL2	Understand
5.	What are the four moments in a cylindrical centre type grinding?	BTL2	Understand
6.	What is meant by centreless grinding?	BTL2	Understand
7.	What is open and dense structure?	BTL2	Understand
8.	Define the term grade used in grinding wheel.	BTL1	Remember
9.	Identify the purpose of grinding process.	BTL2	Understand
10.	Name any two artificial abrasive materials.	BTL1	Remember
11.	List out the types of grinding operations.	BTL1	Remember
12.	Enumerate few principal bonds of grinding wheels.	BTL1	Remember
16.	List out the types of surface grinders.	BTL1	Remember
14.	Write the function of a tool post grinder.	BTL1	Remember
15.	List the operations done in a centerless grinder.	BTL1	Remember
16.	What is meant by dressing and truing?	BTL2	Understand
17.	Point out the defects responsible for inadequate surface integrity.	BTL2	Understand
18.	Enumerate honing.	BTL2	Understand
19.	List out the advantages of centerless grinding.	BTL1	Remember
20.	Write short notes on polishing.	BTL1	Remember
21.	Write the specifications of a broaching machine.	BTL1	Remember
22.	Define Lapping.	BTL1	Remember
23.	Define broaching.	BTL1	Remember

24.	Define Metallization.	BTL1	Remember
25.	Define push broach.	BTL1	Remember

PART – B (16 MARKS)

SL. NO	QUESTIONS	MARKS	LEVEL	COMPETENCE
1	a) The performance of a grinding wheel depends upon the type of abrasive, grain size, grade, structure and bonding material. Discuss the effect of each parameter. b) Describe the characteristics of grinding process.	(9) (7)	BTL4	Analyze
2	Discuss the various bonding materials used for making grinding wheels.	(16)	BTL4	Analyze
3	Explain the working mechanism of cylindrical grinding.	(16)	BTL4	Analyze
4	Briefly discuss about the different types of abrasives used in a grinding wheel.	(16)	BTL4	Analyze
5	Explain why there are so many different types and sizes of grinding wheels.	(16)	BTL4	Analyze
6	Explain the vitrified and resinoid bonding process.	(16)	BTL4	Analyze
7	Explain the working principle and various methods of internal grinding with a neat sketch.	(16)	BTL4	Analyze
8	Summarize the surface grinding process with a neat sketch and list out its merits.	(16)	BTL4	Analyze
9	Explain the working principle and various methods of outside diameter grinding, inside diameter grinding and plunge grinding, with a neat sketch.	(16)	BTL4	Analyze
10	a) Explain the factors to be considered to select a grinding wheel and parameters. b) Describe the use of cutting fluids in grinding process and also list out its merits.	(9) (7)	BTL5	Evaluate
11	a) List the advantages and disadvantages of the centreless grinding process. b) Distinguish surface and cylindrical grinding process.	(9) (7)	BTL4	Analyze
12	Explain the salient features of a centreless grinding machine and discuss the different operations that can be carried out in it. Mention some advantages.	(16)	BTL4	Analyze
16	a) Write briefly about the tool and cutter grinder.	(9)	BTL5	Evaluate

	b) Explain wheel truing and dressing.	(7)		
14	a) Describe the use of cutting fluids in grinding. b) Discuss the various types of broaches.	(9) (7)	BTL3	Apply
15	Write briefly about broaching machines and their operations with neat sketches.	(16)	BTL4	Analyze
16	Discuss push and pull type broaching machines with neat sketches.	(16)	BTL4	Analyze
17	Explain the construction and working principle of a continuous broaching machine.	(16)	BTL5	Evaluate
18	a) Sketch a typical broach and indicate important elements. b) State the advantages and limitations of broaching.	(7) (9)	BTL4	Analyze

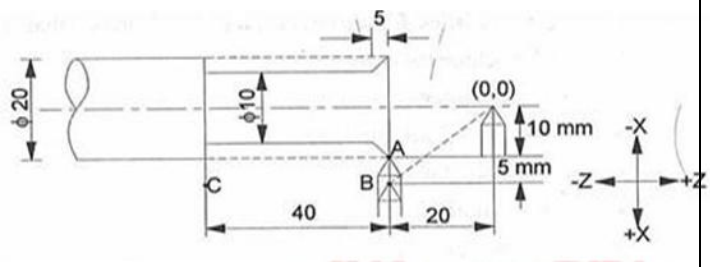
UNIT-V: CNC MACHINE TOOLS AND PART PROGRAMMING

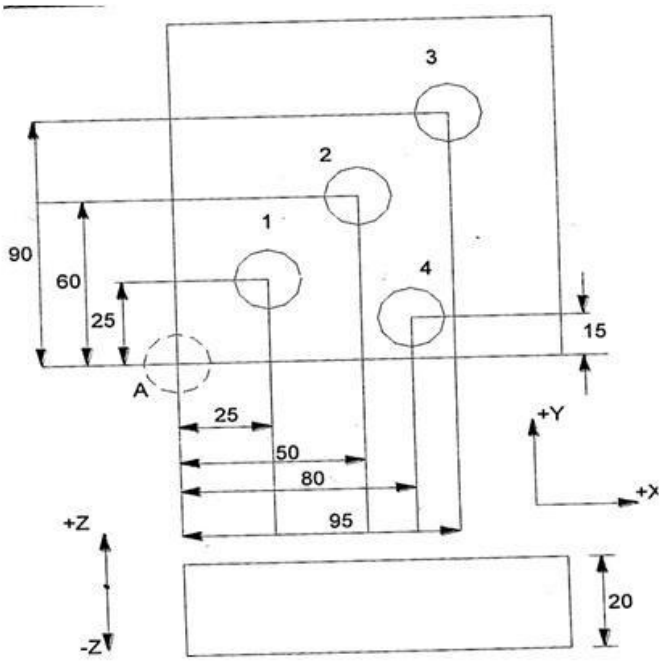
Numerical control (NC) machine tools - CNC: types, constructional details, special features – Design considerations of CNC machines for improving machining accuracy (Structural members, Slide ways, Linear bearings, Ball screws, Spindle drives and feed drives)- Part programming fundamentals – Manual programming – Basic NC programs (introductory programs only) - Post processors.

PART – A (2 MARKS)

Sl.No	QUESTIONS	LEVEL	COMPETENCE
1.	Define numerical control. State its advantages.	BTL1	Remember
2.	List the features of NC part programming.	BTL1	Remember
3.	Draw the simple configuration of CNC machine.	BTL1	Remember
4.	Mention the differences between CNC and DNC.	BTL2	Understand
5.	What is the function of servo valve.	BTL2	Understand
6.	Define absolute and incremental programming.	BTL1	Remember
7.	List the important steps in preparing part programming.	BTL2	Understand
8.	What are the classifications of NC machines?	BTL1	Remember
9.	Compare a closed loop with open loop NC system.	BTL2	Understand
10.	Define interpolation.	BTL1	Remember
11.	Enumerate about post processing.	BTL2	Understand
12.	Why is preparatory function important in CNC Programming?	BTL2	Understand
16.	What are G-codes and M-codes? Write examples.	BTL2	Understand
14.	Name the various elements of CNC machines.	BTL1	Remember
15.	Distinguish point to point and continuous path system.	BTL2	Understand
16.	Define wafer machining.	BTL1	Remember
17.	List out the features of manual part programming.	BTL1	Remember
18.	Distinguish surface and bulk micro machining.	BTL2	Understand
19.	Why re-circulating screws are used in CNC machines?	BTL2	Understand
20.	Differentiate machine reference and tool reference point.	BTL2	Understand
21.	Define subroutine?	BTL1	Remember
22.	Point out the importance of tool nose compensation.	BTL1	Remember
23.	List out the different types of dimensioning system.	BTL1	Remember
24.	Write down the types of statements in APT language.	BTL1	Remember
25.	What is the role of computer in NC machine tool?	BTL1	Remember

PART – B (16 MARKS)

SL. NO	QUESTIONS	MARKS	LEVEL	COMPETENCE
1	Explain the design considerations of CNC machines, which are essential for proper functioning.	(16)	BTL5	Evaluate
2	Explain in brief the basic components of a tape operated NC machine tool.	(16)	BTL4	Analyze
3	With a neat sketch, explain the working of ATC.	(16)	BTL4	Analyze
4	Explain any five motion control statements of computer assisted NC programming and explain.	(16)	BTL4	Analyze
5	Describe the spindle and feed drives. Also state the requirement of the drives in CNC machine tools.	(16)	BTL4	Analyze
6	Explain the following in CNC machining. a) Linear interpolation b) Circular interpolation c) Cubic interpolation	 (6) (6) (4)	BTL4	Analyze
7	Write the part program for the part shown below. 	(16)	BTL4	Analyze
8	Explain the main differences between point to point and continuous path of numerically controlled machine tools, with a specific example.	(16)	BTL4	Analyze
9	Explain the various elements of NC machine with closed loop control system and its implications on NC control.	(16)	BTL4	Analyze
10	Define CNC and DNC. With a help of a diagram explain the architecture of NC machine.	(16)	BTL4	Analyze
11	Discuss the advantages of computer numerical control system. What is the difference between positioning machines and contouring machines? State a few typical applications where the use of numerical control would be justified.	(16)	BTL4	Analyze

12	Describe the spindle drives used in CNC machines and list out their merits.	(16)	BTL4	Analyze
16	Write the part program for drilling holes in the part shown below. The plate thickness is 20mm. 	(16)	BTL5	Evaluate
14	Explain post processors.	(16)	BTL4	Analyze
15	Explain the difference between manual and computer assisted part programming.	(16)	BTL4	Analyze
16	Explain basic NC program.	(16)	BTL4	Analyze
17	Explain slide ways used in CNC machine tools, for various applications.	(16)	BTL5	Evaluate
18	List any five motion control statements of computer assisted NC programming and explain each step in detail.	(16)	BTL5	Evaluate