SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603203

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

IV SEMESTER

1909402 METAL CUTTING AND MACHINE TOOLS

Regulations–2019

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Prepared by

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SUBJECT CODE / NAME : 1909402 / METAL CUTTING AND MACHINE TOOLS

SEMESTER / YEAR : IV SEMESTER / II YEAR

UNIT I - THEORY OF METAL CUTTING			
Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools– nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and machinability.			
PART – A (2 MARKS)			
Sl.No	**QUESTIONS**	**LEVEL**	**COMPETENCE**
1	Define machining process.	BTL1	Remember
2	Classify the relative motion of the cutting tool and the work piece.	BTL3	Apply
3	Differentiate orthogonal cutting and oblique cutting.	BTL2	Understand
4	Mention the various parts of single point cutting tool.	BTL1	Remember
5	Define chip thickness ratio.	BTL1	Remember
6	What is shear plane?	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?	BTL2	Understand
11	What are the factors responsible for a built-up edge in cutting tools?	BTL1	Remember
12	When will negative rake angles be used?	BTL3	Apply
13	What is clearance angle? And mention its types.	BTL1	Remember
14	What is 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	Name the factors that contribute to poor surface finish in cutting.	BTL2	Understand
19	What is 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	List 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?	BTL4	Analyze
25	Write Taylor's tool life equation	BTL1	Remember

PART – B (13 MARKS)

SL. NO	QUESTIONS	MARKS	LEVEL	COMPETENCE
1	a) Explain various classifications of machine tools. b) Describe the mechanism of metal cutting.	(5) (8)	BTL2	Understand
2	What is orthogonal rake system? Show the ORS of tool analysis with the help of a sketch.	(13)	BTL4	Analyze
3	Explain Nomenclature of a single point cutting tool with neat sketches.	(13)	BTL2	Understand
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.	(6) (7)	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.	(13)	BTL4	Analyze
6	Describe an expression for the determination of shear angle in orthogonal metal cutting.	(13)	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.	 (5) (5) (3)	BTL4	Analyze
8	Describe the forms of wears on the cutting tool with neat sketches.	(13)	BTL2	Understand
9	a) Mention the functions of cutting fluids. b) Explain the uses of Cutting Fluids.	(7) (6)	BTL4	Analyze
10	Discuss the various types of chips produced during metal machining with neat diagram.	(13)	BTL1	Remember
11	State the essential requirements and properties of a tool material.	(13)	BTL2	Understand
12	Briefly explain about the popular metal cutting theories. a) Modified Merchant Theory b) Lee and Shaffer's Theory	 (7) (6)	BTL4	Analyze
13	What is the use of chip breaker? Describe various types of chip breaker with neat sketch.	(13)	BTL1	Remember

14	Briefly explain the following with neat sketches: a) Orthogonal Cutting b) Oblique Cutting	 (7) (6)	BTL5	Evaluate
15	Explain various tool materials.	(13)	BTL5	Evaluate
16	What is machinability? And explain in detail.	(13)	BTL1	Remember
17	Explain the parameters which affect surface finish.	(13)	BTL2	Understand
18	What is the tool life equation? and explain the factor affecting the tool life.	(13)	BTL1	Remember

PART – C (15 MARKS)

SL. NO	QUESTIONS	MARKS	LEVEL	COMPETENCE
1	What do you understand by tool life? What is the significance of an engineer who is interested in productivity? What different criteria are used to identify that the tool has reached its limiting life?	(15)	BTL1	Remember
2	Briefly explain the formation Built-up-Edge (BUE). Also justify its causes and effects with suitable sketch.	(15)	BTL4	Analyze
3	What is the measure of metal removing process machinability? What are the factors that affect it?	(15)	BTL2	Understand
4	a) Explain various classifications of machine tools. b) During an orthogonal cutting a chip length of 160 mm was obtained from an uncut chip length of 350 mm. The cutting tool has 22^{O} rake angles and a depth of cut is 0.8 mm. Determine the shear plane angle and chip thickness.	(8) (7)	BTL3	Apply
5	How is metal removed in metal cutting? Explain the process with simple sketch.	(15)	BTL6	Create

UNIT II - TURNING MACHINES

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semiautomatic – single spindle: Swiss type, automatic screw type – multi spindle.

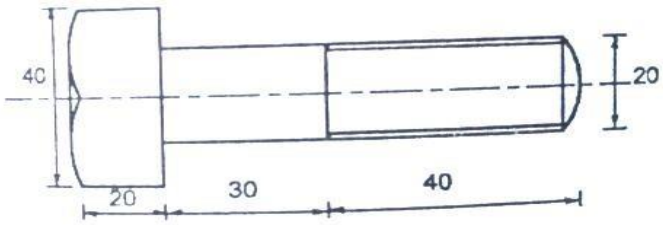
PART – A (2 MARKS)

Sl.No	QUESTIONS	LEVEL	COMPETENCE
1.	What are the various operations 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.	A shaft of diameter 60 mm is to be turned on a lathe at a cutting speed of 45 m/min. Find the required rpm of the shaft.	BTL3	Apply
5.	Discuss the functions of feed rod and lead screw.	BTL3	Apply
6.	Differentiate live centre and dead centre.	BTL2	Understand
7.	What is swing diameter?	BTL2	Understand
8.	Mention various thread cutting methods.	BTL1	Remember
9.	Define the term “Thread catching”.	BTL1	Remember
10.	Define the term “Conicity”.	BTL1	Remember
11.	Write down the names of any four lathe accessories.	BTL1	Remember
12.	What are the uses of head stock?	BTL2	Understand
13.	Calculate the number of teeth on change gears to cut a multi start thread of having 4 starts and pitch 1.25 mm. The pitch on the lead screw is 8 mm.	BTL3	Apply
14.	Specify the differences between capstan and turret lathe.	BTL1	Remember
15.	Mention the need for automatic lathes.	BTL3	Apply
16.	Write about the purpose of the tumbler gear mechanism of a lathe.	BTL3	Apply
17.	Discuss the three stages of a tool layout.	BTL1	Remember
18.	What are the advantages of automatic lathes?	BTL1	Remember

19.	Mention the components that can be turned on a copying lathe.	BTL1	Remember
20.	Define automatic machine.	BTL1	Remember
21	How threads and machining holes are cut in automatic cutting off machine?	BTL5	Evaluate
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 principal of multi spindle automats.	BTL1	Remember

PART – B (13 MARKS)

SL. NO	QUESTIONS	MARKS	LEVEL	COMPETENCE
1	Explain the construction and working principle of a lathe with sketch.	(13)	BTL4	Analyze
2	What is a lathe carriage? Explain the various parts of a lathe carriage with a neat diagram.	(13)	BTL5	Evaluate
3	Discuss any four work holding devices in a lathe with neat sketches.	(13)	BTL4	Analyze
4	Explain any four tool holding devices in a lathe with neat sketches.	(13)	BTL4	Analyze
5	Explain various types of taper turning methods with neat sketches	(13)	BTL4	Analyze
6	Discuss various types of thread cutting operations.	(13)	BTL5	Evaluate
7	Briefly explain the following feed mechanism: a) Tumbler gear reversing mechanism. b) Quick-change gear box.	 (6) (7)	BTL5	Evaluate
8	Enumerate the purpose of various attachments used on a centre lathe with neat sketches.	(13)	BTL4	Analyze
9	Calculate the gears for cutting metric threads of the following pitches.	(13)	BTL4	Analyze

	a) (i) 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.	(6) (7)		
10	Discuss the main parts of a turret lathe with neat sketch.	(13)	BTL4	Analyze
11	Explain the working principle of turret lathe.	(13)	BTL4	Analyze
12	Explain the tooling layout for the production of a Hexagonal bolt in a capstan lathe.	(13)	BTL4	Analyze
13	Write down the difference between a capstan and a turret lathe.	(13)	BTL3	Apply
14	Explain the following with suitable sketches. a) Geneva mechanism b) Bar feeding mechanism	 (6) (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)	(13)	BTL5	Evaluate
16	Discuss about the single spindle automatic lathe and explain Swiss type automatic lathe.	(13)	BTL4	Analyze
17	Classify multi-spindle automatic lathe.	(13)	BTL4	Analyze
18	Explain about the progressive action multi spindle automats with neat sketch.	(13)	BTL4	Analyze

PART – C (15 MARKS)

SL. NO	QUESTIONS	MARKS	LEVEL	COMPETENCE
1	A badly oxidized and uneven round bar is being turned on a lathe. Would you recommend a small or large depth of cut? Explain it.	(15)	BTL4	Analyze
2	Describe the problems, if any, that may be encountered in clamping a work piece made of soft metal in a three-jaw chuck.	(15)	BTL5	Evaluate
3	It has been concluded that cutting speed, feed, and depth of cut are the main parameters in a turning operation. In relative terms, at what values should these parameters be set for a (a) Roughing operation. (b) Finishing operation.	 (7) (8)	BTL6	Create
4	Explain the economic justification for purchasing a turret lathe instead of a conventional lathe.	(15)	BTL5	Evaluate
5	Discuss the tooling layout for the production of a Hexagonal nut in Turret lathe.	(15)	BTL5	Evaluate

UNIT III - SHAPER, MILLING AND GEAR CUTTING MACHINE			
Shaper - Types of operations. Drilling, reaming, boring, Tapping. Milling operations- types of milling cutter- pocket milling, surface contouring- mill turn centers- high speed maching. Gear cutting – forming and generation principle and construction of gear milling, hobbing and gear shaping processes – finishing of gears.			
PART – A (2 MARKS)			
Sl.No	**QUESTIONS**	**LEVEL**	**COMPETENCE**
1.	How the planer differs from the 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?	BTL3	Apply
10.	What do you know about straight fluted drill and fluted drill?	BTL3	Apply
11.	Mention any four shaper specifications.	BTL1	Remember
12.	What are the specifications of the milling machine?	BTL2	Understand
13.	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 and machining time for drilling	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.	BTL3	Apply
21	List out the gear finishing processes.	BTL1	Remember
22	Explain gear hobbing.	BTL4	Analyze

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 (13 MARKS)

SL. NO	QUESTIONS	MARKS	LEVEL	COMPETENCE
1	Explain the principle of operation of a shaper with a neat sketch.	(13)	BTL2	Understand
2	Explain the hydraulic drive mechanism of a horizontal shaper with a neat sketch.	(13)	BTL5	Evaluate
3	Explain the whitworth quick return mechanism with a neat sketch.	(13)	BTL5	Evaluate
4	Sketch and explain the working principle of an upright drilling machine.	(13)	BTL4	Analyze
5	Discuss the various operations performed in drilling machines.	(13)	BTL4	Analyze
6	Explain the twist drill nomenclature and define various elements of twist drill.	(13)	BTL4	Analyze
7	Describe the working of a crank and slotted link quick return shaper mechanism.	(13)	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..	(7) (6)	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.	(6) (7)	BTL4	Analyze
10	Sketch and describe the basic types of milling cutter.	(13)	BTL4	Analyze
11	Describe the working mechanism of a universal dividing head, with neat diagrams.	(13)	BTL4	Analyze
12	a) Explain the gear cutting by a formed tool.	(6) (7)	BTL5	Evaluate

	b) Describe gear cutting by shaping and list the advantages and disadvantages of gear shaping process.			
13	Describe the various types of milling operations.	(13)	BTL4	Analyze
14	Explain the principle of operation of gear hobbing operation.	(13)	BTL5	Evaluate
15	Explain the gear shaving process.	(13)	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.	(7) (6)	BTL4	Analyze
17	Describe the working mechanism of a universal dividing head, with neat diagrams.	(13)	BTL4	Analyze
18	Explain simple indexing, compound indexing and differential indexing with suitable example.	(13)	BTL5	Evaluate

PART – C (15 MARKS)

SL. NO	QUESTIONS	MARKS	LEVEL	COMPETENCE
1	a) Explain the different types of table drive and feed mechanisms in a planning machine. b) Sketch and explain the main parts of a band saw.	(10) (5)	BTL5	Evaluate
2	a) Explain with a sketch “Fast and loose pulleys” quick return mechanism of a planer table. b) Write short notes on expanding hand reamers and adjustable machine reamers.	(10) (5)	BTL5	Evaluate
3	Explain the counter boring and countersinking operation	(13)	BTL5	Evaluate
4	Analyse the various types of special attachments in the milling machine with diagrammatic sketches.	(15)	BTL5	Evaluate
5	State the difference between horizontal and vertical spindle column and knee type milling machines (use simple sketches).	(15)	BTL4	Analyze

UNIT IV - ABRASIVE PROCESS AND BROACHING			
Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications –concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines.			
PART – A (2 MARKS)			
Sl.No	**QUESTIONS**	**LEVEL**	**COMPETENCE**
1.	What do you mean by loading of grinding wheels?	BTL2	Understand
2.	Write the specifications of a grinding machine.	BTL2	Understand
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 centerless 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
13.	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.	Define broaching and write the specifications of a broaching machine.	BTL1	Remember

22.	Define Lapping.	BTL1	Remember
23.	List some of the materials of broaching tools.	BTL1	Remember
24.	Summarize briefly about continuous broaching.	BTL1	Remember
25.	Define push broach.	BTL1	Remember

PART – B (13 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) (4)	BTL2	Understand
2	Discuss the various bonding materials used for making grinding wheels.	(13)	BTL4	Analyze
3	Explain the working mechanism of cylindrical grinding.	(13)	BTL2	Understand
4	Briefly discuss about the different types of abrasives used in a grinding wheel.	(13)	BTL4	Analyze
5	Explain why there are so many different types and sizes of grinding wheels.	(13)	BTL2	Understand
6	Explain the vitrified and resinoid bonding process.	(13)	BTL2	Understand
7	Explain the working principle and various methods of internal grinding with a neat sketch.	(13)	BTL2	Understand
8	Summarize the surface grinding process with a neat sketch and list out its merits.	(13)	BTL4	Analyze
9	Explain the working principle and various methods of outside diameter grinding, inside diameter grinding and plunge grinding, with a neat sketch.	(13)	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.	(7) (6)	BTL5	Evaluate
11	a) List the advantages and disadvantages of the centreless grinding process.b) Distinguish surface and cylindrical grinding process.	(7) (6)	BTL4	Analyze

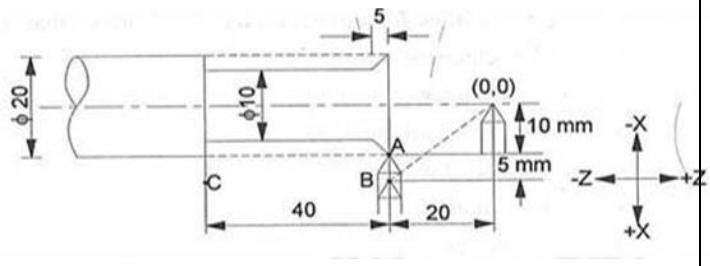
12	Explain the salient features of a centreless grinding machine and discuss the different operations that can be carried out in it. Mention some advantages.	(13)	BTL4	Analyze
13	a) Write briefly about the tool and cutter grinder. b) Explain Wheel truing and dressing.	(7) (6)	BTL5	Evaluate
14	a) Describe the use of cutting fluids in grinding. b) Discuss the various types of broaches.	(7) (6)	BTL3	Apply
15	Write briefly about broaching machines and their operations with neat sketches.	(13)	BTL4	Analyze
16	Discuss push and pull type broaching machines with neat sketches.	(13)	BTL4	Analyze
17	Explain the construction and working principles of a continuous broaching machine.	(13)	BTL5	Evaluate
18	a) Sketch a typical broach and indicate important elements. b) State the advantages and limitations of broaching.	(6) (7)	BTL4	Analyze

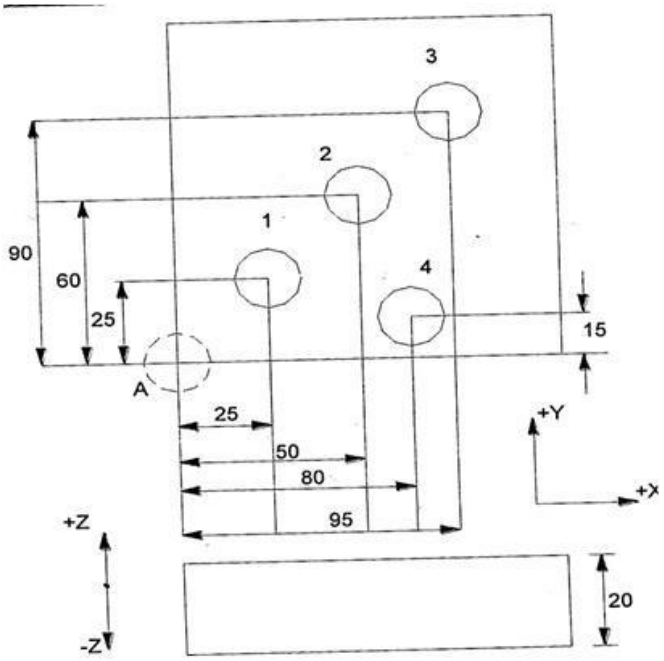
PART – C (15 MARKS)

SL. NO	QUESTIONS	MARKS	LEVEL	COMPETENCE
1	Evaluate the marking system of the conventional and super abrasive grinding wheel with examples.	(15)	BTL4	Analyze
2	Diamonds need to be ground into the desired shapes in order to be used in jewellery. Given that diamond is the hardest material known, how is this accomplished? Give as many details as you can about the variables that could affect the final surface finish after grinding.	(15)	BTL5	Evaluate
3	Describe as many parameters as you can that could affect the final surface finish in grinding.	(15)	BTL4	Analyze
4	Would you recommend broaching a keyway on gear blank before or after machining the teeth? Why?	(15)	BTL4	Analyze
5	Explain with neat sketches the following operation: Honing, Lapping, Super Finishing and Buffering.	(15)	BTL4	Analyze

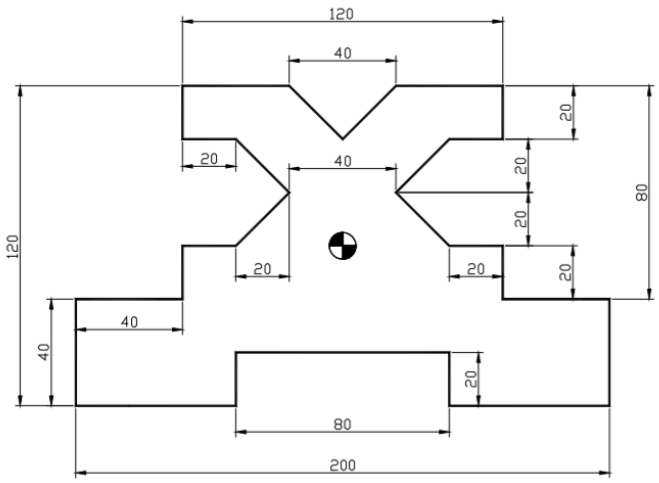
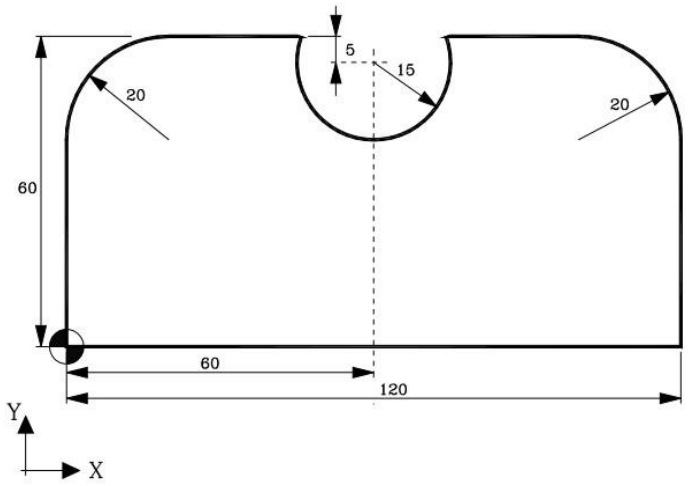
UNIT V - CNC MACHINING			
Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming –micromachining – wafer machining.			
PART – A (2 MARKS)			
Sl.No	**QUESTIONS**	**LEVEL**	**COMPETENCE**
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 difference between CNC and DNC.	BTL1	Remember
5.	What is the function of servo valve.	BTL1	Remember
6.	Define absolute and incremental programming.	BTL1	Remember
7.	What are the important steps to be followed while preparing part programming.	BTL1	Remember
8.	What are the classifications of NC machines?	BTL2	Understand
9.	Compare a closed loop with open loop NC system.	BTL4	Analyze
10.	Define interpolation.	BTL1	Remember
11.	Enumerate about post processing.	BTL2	Understand
12.	Why is preparatory function important in CNC Programming?	BTL2	Understand
13.	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 micro machining and bulk micro machining.	BTL2	Understand
19.	Why re-circulating screws are used in CNC machines?	BTL3	Apply
20.	Differentiate machine reference and tool reference point.	BTL3	Apply
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.	Define micro machining and mention its types.	BTL1	Remember

PART – B (13 MARKS)

SL. NO	QUESTIONS	MARKS	LEVEL	COMPETENCE
1	a) Narrate the design considerations of CNC machines, which are essential for proper functioning. b) Discuss about slide ways used in CNC machine tools, for various applications.	(9) (4)	BTL5	Evaluate
2	Describe in brief the basic components of a tape operated NC machine tool.	(13)	BTL1	Remember
3	With a neat sketch, explain the working of ATC.	(13)	BTL4	Analyze
4	List any five motion control statements of computer assisted NC programming and explain.	(13)	BTL4	Analyze
5	Describe the spindle and feed drives. Also state the requirement of the drives in CNC machine tools.	(13)	BTL1	Remember
6	Explain the following in CNC machining. a) Linear interpolation b) Circular interpolation c) Cubic interpolation	 (5) (5) (3)	BTL4	Analyze
7	Write the part program for the part shown below. 	(13)	BTL4	Analyze
8	Explain the main difference between point to point and continuous path of numerically controlled machine tools, with a specific example.	(13)	BTL4	Analyze
9	Explain the various elements of NC machine with closed loop control system and its implications on NC control.	(13)	BTL4	Analyze
10	Define CNC and DNC. With a help of a diagram explain the architecture of NC machine.	(13)	BTL1	Remember
11	Discuss the advantages of computer numerical control system. What is the difference between positioning	(13)	BTL4	Analyze

	machines and contouring machines? State a few typical applications where the use of numerical control would be justified.			
12	Describe the spindle drives used in CNC machines and list out their merits.	(13)	BTL5	Evaluate
13	Write the part program for drilling holes in the part shown below. The plate thickness is 20mm. 	(13)	BTL5	Evaluate
14	Describe in detail about micro machining using aluminum oxide, silicon carbide, cubic boron nitride (CBN) and diamond.	(13)	BTL4	Analyze
15	Explain the following in micro machining, a) Abrasive jet micro machining b) Ultrasonic micro machining c) Abrasive water jet micro machining	 (5) (5) (3)	BTL5	Evaluate
16	Describe in detail about the silicon wafer processing and direct wafer stepping process.	(13)	BTL4	Analyze
17	Explain the working of plasma etching.	(13)	BTL5	Evaluate
18	List any five motion control statements of computer assisted NC programming and explain each step in detail.	(13)	BTL5	Evaluate

PART – C (15 MARKS)

SL. NO	QUESTIONS	MARKS	LEVEL	COMPETENCE
1	 Justify the absolute coordinates and incremental coordinates for the above fig and point out the best one.	(15)	BTL4	Analyze
2	 Analyze the above fig and write a CNC program that takes minimum time for production.	(15)	BTL4	Analyze
3	Evaluate the contemporary applications of micromachining and wafer machining with suitable case studies.	(15)	BTL5	Evaluate
4	Compare the silicon wafer processing with traditional CNC machining and evaluate the outcome.	(15)	BTL4	Analyze
5.	Explain the various steps to be followed while developing the CNC part programs	(15)	BTL5	Evaluate