



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

## MECHANICAL ENGINEERING

### TUTORIAL QUESTION BANK

<b>Course Name</b>	:	<b>MACHINE TOOLS</b>
<b>Course Code</b>	:	A50321
<b>Class</b>	:	III B. Tech I Semester
<b>Branch</b>	:	ME
<b>Year</b>	:	2017 – 2018
<b>Course Coordinator</b>	:	Mr C. Labesh Kumar, Assistant Professor.
<b>Course Faculty</b>	:	Mr. C. Labesh Kumar, Assistant Professor Mr M. Prashanth Reddy, Assistant Professor.

#### OBJECTIVES:

Machine Tool Technology is an instructional program that prepares individuals to shape metal parts on machines such as lathes, grinders, drill presses, milling machines and shapers. This program includes instruction in safety, making computations related to work dimensions testing feeds and speeds of machines using precision measuring instruments.

S No	QUESTION	Blooms taxonomy level	Course Outcomes
<b>UNIT - I</b>			
<b>Part - A (Short Answer Questions)</b>			
1	Define turning	Knowledge	1
2	Define Milling	Knowledge	1
3	Define Planning	Knowledge	1
4	Define Shaping	Knowledge	1
5	Define Drilling	Knowledge	1
6	Define Shaping	Knowledge	1
7	Explain about orthogonal cutting	Knowledge	2
8	Explain about Oblique cutting	Comprehension	2
9	Classify the cutting tools	Comprehension	2
10	Explain about Single point cutting tool	Comprehension	2
11	Explain about Multi point cutting tool	Comprehension	2
12	Classify single point cutting tools	Application	2
13	Classify Multi point cutting tools	Application	2

14	Define rake angle	Knowledge	2
15	Define Relief angle	Knowledge	2
16	Write about chip formation mechanism	Knowledge	2
17	Write about chip breakers	Knowledge	2
18	Write about cutting speed	Knowledge	2
19	Write about feed	Knowledge	3
20	Define Machinability	Knowledge	4
<b>Part - B (Long Answer Questions)</b>			
1	Explain cutting speed, feed and depth of cut	Knowledge	1
2	Give formula for cutting power in a metal cutting machine and explain about Material removal rate and Specific energy and its significance.	Knowledge	1
3	Discuss about tool life	comprehension	1
4	a. what is a cutting fluid explain different type b. Explain about tool materials	comprehension	1
5	a. The tool signature is given as follows 6-6-5-10-5-5-0.8 label each in the diagram b. Explain ideal properties of cutting tool materials	Applying	1,2
6	With respect to hot/red hardness list the cutting ability of following cutting tool materials a) Carbide b) HSS c) High Carbon Steel d) Low carbon steel	understanding	1
7	It is required to machine a shaft whose diameter is 80 mm with cutting speed of 50m/min determine i. Spindle speed in rpm ii. Feed in m/min iii. Depth of cut iv. MRR	Synthesis	2
8	Discuss about zero rake angle positive rake angle and negative rake angle explain diagrammatically	comprehension	1,2
9	Explain different zones of heat generation	Knowledge	1,2
10	Explain 2D and 3D machining	Knowledge	1,2
11	In orthogonal cutting of mild steel component if the rake angle of the tool is $10^\circ$ and shear angle is $30^\circ$ . Find the chip thickness ratio	Problem solving	2
12	Determine the cutting speed and machining time per cut when the work having 35mm diameter is rotated at 200 rpm. The feed given is 0.2mm/rev and length of cut is 60mm	Synthesis	2
13	(a) Describe basic elements of machining. (b) Explain briefly mechanics of chip formation.	comprehension	2
14	Explain the geometry of single point tool	Knowledge	1
15	Explain briefly about formation of chip.	Knowledge	2
16	Explain different types of chips formed while machining	comprehension	2
17	Write about built up edge is formed and its effect	Knowledge	2
18	Explain the mechanics of orthogonal cutting	comprehension	2
19	Draw merchant force diagram and also resolve the forces related to it	Knowledge	2
20	Angles related to single point cutting tool. Explain the significance	Knowledge	2
<b>Part - C (Problem Solving and Critical Thinking Questions)</b>			
1	In orthogonal cutting of a mild steel component if the rake angle of tool is	Synthesis	1

	30° and shear angle is 30°, find the chip thickness ratio.		
2	Determine the cutting speed and machining time per cut when the work having 35mm diameter is rotated at 200rpm. The feed given is 0.2mm/rev and length of cut is 60mm.	Synthesis	2
3	In orthogonal cutting of a mild steel component if the rake angle of tool is 60° and shear angle is 50°, find the chip thickness ratio.	Synthesis	2
4	Determine the cutting speed and machining time per cut when the work having 50mm diameter is rotated at 1000rpm. The feed given is 0.8mm/rev and length of cut is 50mm.	Synthesis	2
5	Calculate the power required during cutting of a low carbon steel bar 40mm diameter of cutting force is force is 150 kg at 200rpm.	Synthesis	2
6	The useful tool life of a HSS tool machining MS at 18 m/min is hours, calculate the tool life when the tool operates at 24 m/min	Synthesis	2
7	Calculate the power required during cutting of a low carbon steel bar 80mm diameter of cutting force is force is 250 kg at 1000rpm	Synthesis	2
8	The Taylor's tool life equation for machining C-40 steel with a 18-4-1 HSS cutting tool at a feed of 0.2 m/min and a depth of cut 2mm. The following V and T observation have been noted. Calculate n,C and also recommended the cutting speed for a desire tool life of 60min	Synthesis	2
	V (m/min)	25	35
	T (min)	90	20
9	The useful tool life of a HSS tool machining MS at 28 m/min is hours, calculate the tool life when the tool operates at 14 m/min	Synthesis	2
10	The Taylor's tool life equation for machining C-40 steel with a 18-4-1 HSS cutting tool at a feed of 0.8 m/min and a depth of cut 4mm. The following V and T observation have been noted. Calculate n,C and also recommended the cutting speed for a desire tool life of 60min	Synthesis	2
	V (m/min)	35	25
	T (min)	80	30

## UNIT - II

### Part – A (Short Answer Questions)

1	Explain about flange tool holder	Comprehension	5
2	Explain about combination tool holder	Comprehension	5
3	Explain about knee tool holder	Comprehension	5
4	Explain about tool post grinding attachment	Comprehension	5
5	Explain about milling attachment	Comprehension	5
6	Explain about different types of operations done on a lathe	Comprehension	5
7	Discuss any one work holding device used in turret lathe	Comprehension	5
8	Classify different types of mandrels	Application	5
9	Define chamfering	Knowledge	5
10	Define knurling	Knowledge	5
11	Define reaming	Knowledge	5
12	Write about facing	Knowledge	5
13	Write about semi-automatic lathes	Knowledge	5
14	Write about automatic lathes	Knowledge	5
15	Define Mandrel	Knowledge	5
16	Write about fixture	Knowledge	5
17	Classify types of spindle	Application	5
18	Write about single spindle lathe	Knowledge	5
19	Write about multi spindle lathe	Knowledge	5
20	Compare turret lathe and capstan lathe	Application	5

### Part - B (Long Answer Questions)

1	Explain the working principle of lathe	comprehension	4
---	--	---------------	---

2	What is a lathe what are the types of lathe	Analysis	4
3	Explain about work holding devices and tool holding devices	comprehension	5
4	Explain the process of taper turning	comprehension	5
5	Explain diagrammatically the thread cutting on lathe	comprehension	5
6	Calculate suitable Gear Train to produce 4 mm pitch on work piece by using of 11 mm pitch lead screw.	analysis	5
7	List out various lathe attachments	Knowledge	5
8	Explain about principle feature of automatic lathe	comprehension	5
9	Comparison between a turret and capstan lathe	comprehension	5
10	Explain the difference between single spindle and multi spindle lathe	Knowledge	5
11	What are different operations performed on lathe explain briefly	comprehension	5
12	In a HSS tool 18-4-1 in the chemical composition explain each chemical constituent and effect on properties	Applying	5
13	Write the tool layout for hexagonal head bolt	Applying	5
14	Explain about bar feeding and work stoppers	Applying	5
15	Explain about collect arrangement for work holding device	Applying	5
16	Explain relation between pitch on lead screw and pitch on the work piece, RPM and number of teeth on spindle gear and lead screw gear	Comprehension	5
17	Draw a simple sketch of tailstock and explain its function	Knowledge	5
18	Write about any 4 lathe accessories	Knowledge	5
19	Explain the automatic longitudinal feed mechanism in a lathe	Comprehension	5
20	Explain the longitudinal feed mechanism in a lathe	Comprehension	5
<b>Part – C (Problem Solving and Critical Thinking)</b>			
1	Determine the machining time to turn the dimensions given in figure. The material is brass, the cutting speed with HSS tool being 80 m/min and feed is 0.8 mm rev.	Synthesis	5
2	Estimate the machine time to turn a MS bar of 30mm diameter down to 25mm for a length of 100mm in a single cut. Assume cutting as 30 m/min and feed as 0.4 mm/rev.	Synthesis	5
3	Determine the machining time to turn the dimensions given in figure. The material is mild steel, the cutting speed with HSS tool being 100 m/min and feed is 0.9 mm rev.	Synthesis	5
4	Estimate the machine time to turn a MS bar of 40mm diameter down to 35mm for a length of 150mm in a single cut. Assume cutting as 20 m/min and feed as 0.5 mm/rev.	Synthesis	5
5	A CI flange of 300mm OD has a bore of 100 mm. This is to be faced on a lathe. Calculate the machining time to face the part, given the feed 0.8 mm/rev and cutting speed of 80 m/min	Synthesis	5
6	Explain the salient features of an automatic lathes.	Comprehension	5
7	A CI flange of 200mm OD has a bore of 80 mm. This is to be faced on a lathe. Calculate the machining time to face the part, given the feed 0.9 mm/rev and cutting speed of 70 m/min	Synthesis	5
8	Enumerate the various types of automatic lathes.	Analysis	5
9	Describe the main parts of a turret lathe with a line sketch.	Comprehension	5
10	Illustrate the working of quick gear box with a sketch.	Analysis	5
<b>UNIT-III</b>			
<b>Part - A (Short Answer Questions)</b>			
1	Define shaping	Knowledge	6
2	Classify different types of shapers		6
3	Write about working principle of shaper	Knowledge	6
4	Write about cross rail	Knowledge	6

S No	QUESTION	Blooms taxonomy level	Course Outcomes
5	Write about apron	Knowledge	6
6	Write about different types of shaper mechanisms	Knowledge	6
7	Draw the crank and slotted link mechanism used in shaping.	Knowledge	6
8	Write about tool head.	Knowledge	6
9	Write about various operations performed by shaping operations.	Knowledge	8
10	Classify about types of planners	Evaluation	8
11	Define drilling	Knowledge	9
12	Classify different types of drilling machine	Evaluation	9
13	Discuss about various operations of drilling machine.	Comprehension	9
14	Write about Boring	Knowledge	9
15	Write about Reaming	Knowledge	9
16	Write about Lapping	Knowledge	9
17	Write about Trepanning	Knowledge	9
18	Discuss about types of drilling tools	Comprehension	9
19	Name different types of drill holding methods	Knowledge	9
20	Classify different types of boring machines	Evaluation	11
<b>Part – B (Long Answer Questions)</b>			
1	Explain the working principle of shaping and types of shaper	comprehension	6
2	Explain the working principle of slotting and operations performed on it	Analysis	7
3	Explain the principle of planner and types of planner machine	comprehension	8
4	Describe the operation of quick return motion in mechanical shaper	comprehension	6
5	Write the difference between shaping and planning machine	comprehension	6,8
6	Explain the types of drilling machine that are used in machine shop	Knowledge	9
7	Write about the different types of drills used explain the function of each of the drill type	comprehension	9
8	Explain about boring and types of boring machine	comprehension	11
9	Show with neat sketch a twist drill and label the important features	Knowledge	9
10	Write about the work holding device of boring and drilling machine	comprehension	9,11
11	Explain the cutting parameters in Shaping machine	comprehension	6
12	state the working principle of drilling machine	comprehension	9
13	Write about the principle of planner and types of planner machine	comprehension	8
14	Compare the difference between shaping and planning machine	comprehension	6,8
15	Write about the operation of quick return motion in mechanical shaper	comprehension	6
16	Discuss about the different types of drills used explain the function of each of the drill type	comprehension	9
17	Discuss the cutting parameters in Shaping machine	Comprehension	6
18	Discuss about the types of drilling machine that are used in machine shop	Knowledge	9
19	Discuss about the working principle of shaping and types of shaper	Comprehension	6
20	Describe the shaper indicating its principal parts with aid of neat sketch	Comprehension	6
<b>Part – C (Problem Solving and Critical Thinking)</b>			
1	Describe the shaper indicating its principal parts with the aid of neat sketch.	Comprehension	6
2	Explain the crank and slotted link mechanism for shaper ram, line	Comprehension	6

S No	QUESTION	Blooms taxonomy level	Course Outcomes
	diagram.		
3	Explain the principle of operation of hydraulic shaper and draw the velocity diagram for the shaper.	Comprehension	6
4	Compare the shaper and planer with respect to the construction, principle of working and application.	Evaluation	6
5	Explain the whitworth mechanism of obtaining Quick return mechanism in a slotter.	Comprehension	6
6	Explain the principle of operation of a planer using a sketch.	Comprehension	8
7	Explain the silent features of double housing plane with a line sketch.	Comprehension	8
8	With a simple sketch explain the working of a planning machine table and feed driver.	Comprehension	8
9	“Quick return motion is achieved by belt drive in planer”. Explain	Comprehension	8
10	Write a brief note on various planner machines.	Knowledge	8
<b>UNIT-IV</b>			
<b>Part – A (Short Answer Questions)</b>			
1	Define Milling	Knowledge	10
2	Name different types of Knee and Column type milling machines.	Knowledge	10
3	Name different types of production milling machines.	Knowledge	10
4	Name some special milling machines.	Knowledge	10
5	Name principal parts of knee and column type milling machine.	Knowledge	10
6	Write about the limitations of a milling machine?	Knowledge	10
7	Name two milling methods	Knowledge	10
8	Define conventional milling	Knowledge	10
9	Define Climb milling	Knowledge	10
10	Define milling cutter	Knowledge	10
11	Name the materials used for milling cutters	Knowledge	10
12	Write about plain milling cutter.	Knowledge	10
13	Write about side milling cutter	Knowledge	10
14	Write about the use of metal slitting saw cutter	Knowledge	10
15	Define angle milling cutter	Knowledge	10
16	Define lip angle	Knowledge	10
17	Define dedendum	Knowledge	10
18	Define land	Knowledge	10
19	Write about milling fixture	Knowledge	10
20	Write about pitch diameter	Knowledge	10
<b>Part – B (Long Answer Questions)</b>			
1	Classify of milling machines	Analysis	10
2	Write about the various types of milling cutters used in milling explain	Knowledge	10
3	Differentiate between up milling and down milling explain their application	comprehension	10
4	Compare compound indexing and differential indexing	Knowledge	10
5	Write about the various work holding devices in milling.	Analysis	10
6	Explain briefly about lapping process and honing process	Knowledge	10
7	Compare lapping and honing operations	comprehension	10

S No	QUESTION	Blooms taxonomy level	Course Outcomes
8	Specify the honing parameters for good honing process	comprehension	10
9	explain principle related to broaching and types of broaching machines	Knowledge	10
10	Write about various advantages and limitations of honing and lapping	comprehension	10
11	Explain the principle of milling machine	Comprehension	10
12	Write about different types of Knee and Column type milling machines.	Knowledge	10
13	Write about different types of production milling machines.	Knowledge	10
14	Write about different special milling machines.	Knowledge	10
15	Write about principal parts of knee and column type milling machine.	Knowledge	10
16	Discuss about the materials used for milling cutters	Comprehension	10
17	Explain about plain milling cutter.	Comprehension	10
18	Explain about side milling cutter	Comprehension	10
19	Explain about the use of metal slitting saw cutter	Comprehension	10
20	Explain about various advantages and limitations of honing and lapping	comprehension	10
<b>Part – C (Problem Solving and Critical Thinking)</b>			
1	Write a short note on tip, helix and rake angles in drilling	Knowledge	9
2	Find the time required to drill 4 holes in a CI flange of 20mm depth, if the hole diameter is 20mm. Assume cutting speed as 21.9 m/min and feed as 0.02 cm/rev.	Synthesis	9
3	A 9 cm thick laminated plate consists of a 7cm thick brass and a 2cm thick mild steel plate. A 20 mm diameter hole is to be drilled through the plate. Estimate the total time taken for drilling if Cutting speed of brass = 44 m/min Cutting speed for mild steel = 30 m/min Feed of 20mm drill for brass = 0.26 mm/rev	Synthesis	9
4	Find the time required to drill 5 holes in a CI flange of 40mm depth, if the hole diameter is 30mm. Assume cutting speed as 24.9 m/min and feed as 0.06 cm/rev.	Synthesis	9
5	A 9 cm thick laminated plate consists of a 7.5cm thick brass and a 2.5cm thick mild steel plate. A 30 mm diameter hole is to be drilled through the plate. Estimate the total time taken for drilling if Cutting speed of brass = 47 m/min Cutting speed for mild steel = 32 m/min Feed of 20mm drill for brass = 0.36 mm/rev	Synthesis	9
6	How long will it take a 12.7 mm to drill a hole 50mm deep is brass. Take cutting speed as 75 m/min and feed as 0.175 mm/rev. Take $A=0.8D$ for through hole.	Synthesis	9
7	A 15mm hole is to be drilled in a CI block with a feed of 0.4 mm/rev. The thickness of the block is 70mm and tool, speed is 25m/min. Determine i. Rpm ii. Machining time	Synthesis	9
8	How long will it take a 13.7 mm to drill a hole 60mm deep is brass. Take cutting speed as 85 m/min and feed as 0.185 mm/rev. Take $A=0.9D$ for through hole.	Synthesis	9
9	A 16mm hole is to be drilled in a CI block with a feed of 0.5 mm/rev. The thickness of the block is 80mm and tool, speed is 26 m/min. Determine i. Rpm ii. Machining time	Synthesis	9
10	A hollow spindle is bored to enlarge its hole diameter from 20 to 25 mm upto 100mm depth is single cut. Estimate the boring time, if cutting speed is 22 m/min and feed is 0.2 mm/rev.	Synthesis	9
<b>UNIT-V</b>			
<b>Part - A (Short Answer Questions)</b>			

S No	QUESTION	Blooms taxonomy level	Course Outcomes
1	Define grinding	Knowledge	12
2	Write about limitations of grinding	Knowledge	12
3	Write about applications of grinding	Knowledge	12
4	Define trough feed	Knowledge	12
5	Define infeed	Knowledge	12
6	Write about types of abrasives	Knowledge	12
7	Define bond	Knowledge	12
8	Define grain	Knowledge	12
9	Define Grain spacing	Knowledge	12
10	Define honing	Knowledge	12
11	Write about Grid	Knowledge	12
12	Write about Grade	Knowledge	12
13	List different type of bonds used in the manufacture of grinding wheel.	Knowledge	12
14	Name grinding wheel shapes	Knowledge	12
15	Write about dressing	Knowledge	12
16	Write about truing	Knowledge	12
17	List types of dressing tools	Knowledge	12
18	Write about the standard marking system for grinding wheel	Knowledge	12
19	Write about mounting points	Knowledge	12
20	List about different grinding materials	Knowledge	12
<b>Part - B (Long Answer Questions)</b>			
1	“Grinding different from other machining operations” Explain.	Analysis	12
2	Specify different grinding machines	knowledge	12
3	Write about the different types of abrasives used in grinding wheel explain them	comprehension	12
4	Explain about is selection of abrasive for grinding operation	knowledge	12
5	Mention various types of bonds used in making of grinding wheel also mention their application	Analysis	12
6	Describe grinding wheel structure with a neat sketch	knowledge	12
7	Compare grinding honing and lapping	comprehension	12
8	Write about the advantages and limitations of using center less grinding	comprehension	12
9	Describe dressing and balancing in grinding requirement in grinding	knowledge	12
10	Briefly describe about tool and cutter grinding machine	comprehension	12
11	Explain mounted wheels and diamond wheels	Comprehension	12
12	Explain about common methods of grinding	Comprehension	12
13	Describe the function of the abrasive grain in the grinding wheel	Knowledge	12
14	Write about natural and artificial abrasives?	Knowledge	12
15	Explain about the principle of cylindrical grinding	Comprehension	12
16	Classify types of internal grinders	Evaluation	12
17	Name the main attachment used on a tool and cutter grinder	<b>Knowledge</b>	12
18	Explain about importance of coolant in grinding applications	Comprehension	12
19	Sketch and describe the different parts of a external cylindrical grinder.	Comprehension	12
20	Explain the factors to be kept in mind in selecting a grinding wheel.	Comprehension	12



S No	QUESTION	Blooms taxonomy level	Course Outcomes
<b>Part – C (Problem Solving and Critical Thinking)</b>			
1	A shaft of st 42, 40 $\phi$ , 400 mm long is to be ground. It is supplied with a grinding size of 40.3 $\phi$ . Calculate the machining time where grinding wheel is 40mm wide, feed per cycle 20mm. No of cuts=15.	Synthesis	12
2	Find the time required for doing rough grinding of a 16 cm sling step 1 shaft to reduce its diameter from 4.2 to 4cm in a grinding wheel of 2 cm face width. Assume cutting speed as 16.5 m/min and depth of cut as 0.25 mm.	Synthesis	12
3	A shaft of st 42, 40 $\phi$ , 500 mm long is to be ground. It is supplied with a grinding size of 40.3 $\phi$ . Calculate the machining time where grinding wheel is 50mm wide, feed per cycle 30mm. No of cuts=16.	Synthesis	12
4	\`q	Synthesis	12
5	The top of a CI table of size 40 x 90 cm is to be ground by a wheel having 2cm face width. If the feed is 1/4 <sup>th</sup> of the width of the wheel and the table moves 9m in one minute, find out the time required for the grinding in two cuts.	Synthesis	12
6	Describe the construction and working of a tool d cutter grinding	Comprehension	12
7	The top of a CI table of size 50 x 100 cm is to be ground by a wheel having 3cm face width. If the feed is 1/4 <sup>th</sup> of the width of the wheel and the table moves 10m in one minute, find out the time required for the grinding in two cuts.	Synthesis	12
8	Discuss about the main attachment used on a tool and cutter grinder.	Comprehension	12
9	Sketch and describe the different parts of a external cylindrical grinder.	Comprehension	12
10	Discuss about different types of wheel materials.	Comprehension	12

Prepared By: Mr. C. Labesh Kumar, Assistant Professor

HOD, MECHANICAL ENGINEERING