# INSTITUTE OF AERONAUTICAL ENGINEERING

**(Autonomous)**

Dundigal, Hyderabad - 500 043

## MECHANICAL ENGINEERING

## DEFINITIONS AND TERMINOLOGY QUESTION BANK

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| **Course Name** | **:** | **MANUFACTURING TECHNOLOGY** |
| **Course Code** | **:** | **AMEB16** |
| **Program** | **:** | **B.Tech** |
| **Semester** | **:** | **V** |
| **Branch** | **:** | **Mechanical Engineering** |
| **Section** | **:** | **A& B** |
| **Academic Year** | **:** | **2020 - 2021** |
| **Course Coordinator** | **:** | **Dr. K. China Apparao, Associate Professor** |

### COURSE OBJECTIVES:

| **The student will try to learn:** | |
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| I | The fundamental concepts of the metal cutting principles to study the behavior of various machining processes |
| II | The importance of tool materials, cutting parameters, cutting fluids and tool wear mechanisms for optimized machining |
| III | The principles of linear and angular measuring instruments for accurate measurement of a given component |
| IV | The mechanics of machining process and optimization of various significant parameters in order to yield the optimum machining. |

### COURSE OUTCOMES:

| **After successful completion of the course, students will be able to:** | | |
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| **Course Outcomes** | | **Knowledge Level (Bloom's Taxonomy)** |
| CO 1 | **Recognize** the importance of geometry of cutting tools, coolants and tool materials for the analysis of material behavior during manufacturing processes | Remember |
| CO 2 | **Illustrate** mechanism of orthogonal and oblique cutting along with developed cutting forces | Understand |
| CO 3 | **Explain** the chip formation mechanism by measuring the cutting forces during the chip formation process | Understand |
| CO 4 | **Explain** the operational principles of different lathe machines and various reciprocating machines for quality machining | Understand |

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| CO 5 | **Select** a machining operation, corresponding machine tool for a specific application in real time | Remember |
| CO 6 | **Identify** most significant process parameters in machine tool for optimal machining | Remember |
| CO 7 | **Explain** the working principles of Milling, drilling and surface grinding machines for manufacturing the components of their requirement | Understand |
| CO 8 | **Estimate** machining times for machining operations at specified levels of cutting parameters of machine tools | Apply |
| CO 9 | **Apply** the principles of limits, fits and tolerance while designing and manufacturing the components of their requirement | Apply |
| CO10 | **Choose** an appropriate measuring instrument for accurate inspection of the dimensional and geometric features of a given component | Apply |
| CO11 | **Apply** various methods for the measurements of screw threads, surface roughness parameters and the working of optical measuring instruments | Apply |
| CO12 | **Analyze** the results of various measuring systems and instruments for motion and dimensional measurements | Analyze |

# DEFINITIONS AND TERMINOLOGY QUESTION BANK

| S.No | QUESTION | ANSWER | Blooms Level | CO |
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| | | **MODULE-I** | | |
| 1 | What Metal Cutting ? | Metal cutting or machining is the process of by removing unwanted material from a block of metal in the form of chips. | Remember | CO 1 |
| 2 | What are the important characteristics of materials used for cutting tools? | High red hardness<br>High wear resistance<br>Low frictional co- efficient<br>High toughness<br>High thermal conductivity | Remember | CO 1 |
| 3 | How do you define tool life? | The time period between two consecutive resharpening, with which the cuts the material effectively is called as tool life. | Remember | CO 1 |
| 4 | What is tool signature? | The various angles of tools are mentioned in a numerical number in particular order. That is known as tool signature. | Remember | CO 1 |
| 5 | What is the effect of back rack angle and mention the types? | Back rake angle of tool is increases the strength of cutting tool and cutting action. It can be classified in to two types.<br>1. Negative Rake angle.<br>2. Positive rake angle. | Remember | CO 1 |
| 6 | Explain the nose radius? | Joining of side and end cutting edges by means of small radius in order to increase the tool life and better surface finish on the work piece. | Understand | CO 1 |
| 7 | What are all conditions for using positive rake angle? | 1. To machine the work hardened materials.<br>2. To machine low strength ferrous and non-ferrous metals.<br>3. To machine long shaft of small diameters.<br>4. To machine the metal blow recommended cutting speeds.<br>5. Using small machine tools with low horsepower. | Remember | CO 1 |
| 8 | Define the orthogonal and oblique cutting. | Orthogonal cutting: The cutting edge of tool is perpendicular to the work piece axis. Oblique cutting: | Remember | CO 1 |

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| | | The cutting edge is inclined at an acute angle with normal to the cutting velocity vector is called oblique cutting process. | | |
| 9 | What are the favorable factors for discontinuous chip formation? | Maching of brittle materials.<br>Small rake angle<br>Higher depth of cut<br>Low cutting speeds<br>Excess cutting fluid.<br>Cutting ductile materials with low speed and small rake angle of the tool. | Remember | CO 1 |
| 10 | What are the favorable factors for continuous chip formation? | Small rake angle<br>Low cutting speed<br>Strong adhesion between chip and tool face.<br>Coarse feed<br>Insufficient cutting fluid.<br>Large uncut thickness. | Remember | CO 3 |
| 11 | Define machineability of metal. | Machine ability is defined as the ease with which a material can be satisfactorily machined.Life of the tool before tool failure or resharpening. | Remember | CO 1 |
| 12 | What is shear plane? | The material of work piece is stressed beyond its yield point under the compressive force. This causes the material to deform plastically and shear off. The plastic floe takes place in a localized region is called a shear plane. | Remember | CO 2 |
| 13 | What is chip and mention its different types? | The sheared material begins to along the cutting tool face in the form of small pieces is called chip. The chips are mainly classified into three types.<br>a. Continuous chip.<br>b. Discontinuous chip.<br>c. Continuous chip with built up edge. | Understand | CO 3 |
| 14 | Define “Side relief” and “End relief” angle. | Side relief angle: It is the angle between the portion of the side flank immediately below the side cutting edge and a line perpendicular to the base of the tool, and measured at right angle to the side flank.<br>End relief angle: It is the angle between the portion of the end flank immediately below the end cutting edge and a line perpendicular to the base of the tool, and measured at right angle to the angle. | Remember | CO 1 |
| 15 | What is the importance of Nose Radius? | Nose radius is favorable to long tool life and good surface finish. A sharp point on the end of a tool is highly stressed, Short lived and leaves a groove in the path of cut. There is an improvement in surface finish and permissible cutting speed as nose radius is increased from zero value. | Remember | CO 1 |
| **MODULE-II** | | | | |
| 1 | What is a lathe machine? | A lath Machine is used for cutting, drilling, knurling and other related machine operations. Lath is one of the old machines that are used for cutting and knurling operations. This machine has the property of producing a three-dimensional surface. | Remember | CO 4 |
| 2 | What are the different types of lathe machines? | The four main types of lathes areSpeed Lathes, Engine Lathes, Tool Room Lathes and<br>Turret Lathes | Remember | CO 4 |
| 3 | Explain the working lathe machine? | Lathe Machine:-The lathe is a machine tool which holds the workpiece between two rigid and strong supports called centers or in a chuck or face plate | Understand | CO 4 |

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| | | which revolves. The cutting tool is rigidly held and supported in a tool post which is fed against the revolving work. The normal cutting operations are performed with the cutting tool fed either parallel or at right angles to the axis of the work. | | |
| 4 | Show the parts of a lathe machine? | Bed.<br>Tool post.<br>Chuck.<br>Headstock<br>Tailstock<br>Lead screw<br>Carriage. | Understand | CO 4 |
| 5 | What are the different types of Lathe oprations? | The engine lathe is an accurate and versatile machine on which many operations can be performed. These operations are:<br>Plain Turning and Step Turning<br>Facing<br>Parting<br>Drilling<br>Reaming<br>Boring<br>Knurling<br>Grooving<br>Threading<br>Forming | Remember | CO 4 |
| 6 | What are the specifications of the Lathe machine? | A machine tool may have a large number of various features and characteristics. But only some specific salient features are used for specifying a machine tool.<br>The methods of specification of Centre lathe are as follows:<br>• Maximum diameter and length of the jobs that can be accommodated<br>• Power of the main drive (motor)<br>• Range of spindle speeds<br>• Range of feeds<br>• Space occupied by the machine. | Remember | CO 4 |
| 7 | What is the difference between a lathe and a milling machine? | In Lathe machine work-piece is hold by the spindle which rotate as per the feed, where as the rigidly fixed tool move against the work-piece to cut it as per the desired need. However, In Milling machine the tool is hold by the spindle which rotate as per the feed, where as the rigidly fixed work-piece move against/along the tool to get cut as per the desired need. | Remember | CO 5 |
| 8 | What is Lathe machine application? | Applications of Lathe Machine are as follows:<br>Metalworking<br>Wood turning<br>Acrylic Spinning<br>Metal Spinning<br>Thermal Spraying<br>Pottery | Remember | CO 4 |
| 9 | What is single spindle automatic lathe? | A single spindle automatic lathe is a modified form of turret lathe. These machines have an addition to a 6-station turret, a maximum of 4 cross slides. ... It is general to use more than one tool on a turret station. External threading is usually carried out by a thread chasing attachment. | Remember | CO 4 |
| 10 | What is the difference between capstan and turret lathe? | Construction of turret/capstan lathes is similar to engine lathe but difference is they have an axially | Remember | CO 5 |

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| | | movable index able turret having hexagonal shape in place of tail stock on which multiple tools are fitted. ... All these tools are mounted on a hexagonal turret; turret is rotates after each operation | | |
| 11 | What are the uses of shaping machine? | A shaper is a type of machine tool that uses linear relative motion between the workpiece and a single-point cutting tool to machine a linear toolpath. Its cut is analogous to that of a lathe, except that it is (archetypally) linear instead of helical. | Remember | CO 4 |
| 12 | How does the process of shaping differ from planing? | The main difference between these two processes is that in shaping the tool reciprocates across the stationary workpiece. Planing motion is the opposite of shaping. Both planing and shaping are rapidly being replaced by milling. The mechanism used for this process is known as a planer. | Remember | CO 4 |
| 13 | Which mechanism is used in slotting machine? | The slotting machine is a reciprocating machine tool in which, the ram holding the tool reciprocates in a vertical axis and the cutting action of the tool is only during the downward stroke. | Remember | CO 4 |
| 14 | How is feeding done on a shaping machine? | It's a machine that can make slots and grooves using a thin cutting tool. The linear cutting motion is provided by the “Quick- Return Mechanism“. The shaping machine is used to machine flat metal surfaces especially where a large amount of metal has to be removed. | Remember | CO 5 |
| 15 | What is the difference between shaper and planner? | The basic and main difference between shaper and planer is that in shaper machine work piece is fixed at the table and tool is in reciprocating motion which rub the work piece and cut unwanted metal. ... But in planer machine tool is act like as stationary body and work piece move over it. | Remember | CO 5 |
| | | **MODULE-III** | | |
| 1 | Briefly explain the function of a milling machine? | The milling machine is used in shaping flat and irregular surfaces. Aside from this main function, the milling machine can also perform other tasks such as drilling, routing, planning, cutting gears, boring, and producing slots among others. | Understand | CO 7 |
| 2 | What is the working principle of milling machine? | A milling machine may also be used for drilling, slotting, making a circular profile and gear cutting by having suitable attachments. Working Principle: The workpiece is holding on the worktable of the machine. The table movement controls the feed of the workpiece against the rotating cutter. | Remember | CO 7 |
| 3 | How many types of milling operations are there? | There are two basic types of milling operations, (a) peripheral milling and (b) face milling. Most milling operations create geometry by generating the shape. | Remember | CO 7 |
| 4 | What is milling machine and its types? | Definition. Milling is a process performed with a machine in which the cutters rotate to remove the material from the work piece present in the direction of the angle with the tool axis. With the help of the milling machines one can perform many operations and functions starting from small objects to large ones | Remember | CO 7 |
| 5 | What are the parts of milling machine? | Milling Machine Parts:<br>**Base:** It is the foundation part of a milling machine.<br>**Column:** Column is another foundation part of the milling machine.<br>**Knee:** Knee is the first moving part of milling machine. | Remember | CO 7 |

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| | | **Saddle:** It is placed between table and the knee and work as intermediate part between them. | | |
| 6 | What materials can be milled? | Common materials that are used in milling include the following:<br>• Aluminum.<br>• Brass.<br>• Magnesium.<br>• Nickel.<br>• Steel.<br>• Thermoset plastics.<br>• Titanium.<br>• Zinc. | Remember | CO 7 |
| 7 | What is a universal milling machine? | Definition of universal milling machine. : a milling machine having a table fitted with all motions and a dividing head with change gears so that it can perform any type of milling operation. | Remember | CO 7 |
| 8 | What is a planer type milling machine?expain briefly | A planer is a type of metalworking machine tool that uses linear relative motion between the workpiece and a single-point cutting tool to cut the workpiece. | Understand | CO 7 |
| 9 | What is the difference between a shaper machine and a planer machine? | In a shaper machine work is held stationary and the cutting tool on the ram is moved back and forth across the work. In a planar machine, the tool is stationary and work piece travels back and forth under the tool. ... A planer is meant for larger jobs than can be undertaken on a shaper. | Understand | CO 7 |
| 10 | What is the difference between drilling and boring? | Boring, on the other hand, is a process of enlarging a hole that has already been made by another process (such as drilling or casting). In short, boring is a secondary finishing operation. Drilling requires a cutting tool called a drill bit. ... A straight hole is drilled with a specific diameter and depth. | Understand | CO 7 |
| 11 | How are boring machines classified? | Boring operations can be performed on other than boring machines, such as lathes, milling machines and machining centers. Boring machines, like most other machine tools, can be classified as horizontal or vertical. | Apply | CO 7 |
| 12 | What does reaming mean in drilling? | A reamer is a type of rotary cutting tool used in metalworking. Precision reamers are designed to enlarge the size of a previously formed hole by a small amount but with a high degree of accuracy to leave smooth sides. ... The process of enlarging the hole is called reaming. | Remember | CO 7 |
| 13 | What are the types of boring machines? | Multiple heads type horizontal boring machine.<br>Table Type Horizontal Boring Machine. The table types are the most common of all horizontal boring machines.<br>Floor Type Horizontal Boring Machine.<br>Planer Type Horizontal Boring Machine.<br>Multiple Head Type Horizontal Boring Machine. | Understand | CO 7 |
| 14 | What is the difference between tapping and drilling? | Drilling and tapping are two distinct actions. Drilling refers to creating a smooth hole in a material with a drill and motor. Tapping is the action that creates a thread into the side of the hole. | Understand | CO 7 |
| 15 | What is counter boring in drilling? | Drilling Operations. Counter boring. Counter boring: Counter boring is the operation of enlarging one end of an existing hole concentric with the original hole with square bottom. ... The cutting edges of the counter- | Remember | CO 7 |

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| | | bore (tool used for counter boring) may have straight or spiral teeth | | |
| | | **MODULE-IV** | | |
| 1 | What is meant by limits and fits? | LIMITS, FITS AND TOLERANCE.The relationship existing between two parts which are to be assembled with respect to the difference on their sizes before assembly is called a fit. Tolerance is defined as the total permissible variation of a size. It is the difference between maximum limit and minimum limit of size. | Remember | CO 9 |
| 2 | What are the 3 types of tolerances? | Three basic tolerances that occur most often on working drawings are: limit dimensions, unilateral, and bilateral tolerances. Three basic tolerances that occur most often on working drawings are: limit dimensions, unilateral, and bilateral tolerances. | Remember | CO 9 |
| 3 | What is difference between tolerance and allowance? | Firstly, tolerance is the permissible variation in dimension of a component (hole or shaft), whereas allowance is the prescribed difference between dimension of two mating parts. Secondly, tolerance is the difference between higher and lower limits of a dimension, depending on the manufacturing capability of a machine. | Understand | CO 9 |
| 4 | What are the three types of fits? | Types of fit. The three types of fit are: Clearance: The hole is larger than the shaft, enabling the two parts to slide and / or rotate when assembled. Location / transition: The hole is fractionally smaller than the shaft and mild force is required to assemble / disassemble. | Understand | CO 9 |
| 5 | What is difference between allowance and clearance? | Allowances: Allowance is the difference between the dimensions of two mating part(hole and shaft) for any type of fit. It is the minimum clearance (positive allowance) or maximum interference (Negative allowance) between parts. 1. Allowance = 1.250-1.248=0.002 | Understand | CO 9 |
| 6 | What are clearance fits? | Clearance. In a fit, this is the difference between the sizes of the hole and the shaft, before assembly, when this difference is positive. The clearance may be maximum clearance and minimum clearance. Minimum clearance in the fit is the difference between the maximum size of the hole and the minimum size of the shaft. | Remember | CO 9 |
| 7 | Why do slip gauges stick together? | Wringing is the process of sliding two blocks together so that their faces lightly bond. Because of their ultra-flat surfaces, when wrung, gauge blocks adhere to each other tightly. This force causes gauge blocks to adhere even without surface lubricants, and in a vacuum. | Apply | CO 9 |
| 8 | What is the difference between tolerance and respect? | Respect is “admiration felt or shown for someone or something that you believe has good ideas or qualities.” In real-life terms, tolerance means accepting that something different has a right to exist, whether or not you agree with it, while respect means a high regard for that something. | Understand | CO 9 |
| 9 | Why is tolerance necessary? | Tolerance is needed in all spheres of life, and on every level and on every stage, because it plays a vital role to establish peace and love, from the smallest unit up to the highest unit of society. ... Tolerance must be shown from both sides on issues, in order for it to be effective. | Remember | CO 9 |

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| 10 | How is Sine bar calculated? | Sine Bar Formula. The formula that relates the angle of the Sine Bar to the height of the spacer stack is: Sin(Angle) = H / L, where H is the height and L is the length, center to center, between the rolls. The Sin of 30 degrees is 0.5. | Remember | CO 10 |
| 11 | Why is a sine bar not suitable for measuring angle above 45? | The mechanical reason is that the cylinders at the end of the sine bar need to have proper vertical support, and this is hard if the angle is very high. ... The mathematical reason is that any angle above 45 degrees can be generated anyway by generating its complement in a rectangular triangle. | Remember | CO 10 |
| 12 | What is meant by angular measurement? | The radian is the derived quantity of angular measurement in the SI system. By definition, it is dimensionless, though it may be specified as rad to avoid ambiguity. Angles measured in degrees, are shown with the symbol °. Subdivisions of the degree are minute (symbol ', 1' = 1/60°) and second {symbol ", 1" = 1/3600°}. | Remember | CO 10 |
| 13 | What are slip gauges used for? | They are used as a reference for the calibration of measuring equipment used in machine shops, such as micrometers, sine bars, calipers, and dial indicators (when used in an inspection role). Gauge blocks are the main means of length standardization used by industry. | Remember | CO 10 |
| 14 | What are the types of mechanical gauges? | Types of Mechanical Gauges. Ruler and scales: They are used to measure lengths and other geometrical parameters. They can be single steel plate or flexible tape type tool. Calipers: They are normally of two types- inside and outside caliper. | Understand | CO 10 |
| 15 | What are the instruments used for measurement? | For different types of machinery and systems, various measuring tools, instruments and gauges are used on a ship. Measuring instruments and gauges are used to measure various parameters such as clearance, diameter, depth, ovality, trueness, etc. | Remember | CO 10 |
| | **MODULE-V** | | | |
| 1 | what is Tool maker's microscope | Toolmakers microscope is a measuring device that can be used to measure up to 1/100th of an mm. It works on the principle of a screw gauge, but a few changes were added to it to make its operation easier.It needs application of optics too | Remember | CO 11 |
| 2 | What is a Function of Tool maker's microscope? | Unlike a conventional light microscope, a toolmakers microscope is typically used as a measuring device. As such, it can be used to measure up to 1/100th of a mm. This makes these microscopes suitable for such functions as the inspection and measurement of various miniature mechanical and electronic parts. | Remember | CO 11 |
| 3 | What is an application of Tool maker's microscope? | A toolmakers microscope can be used for the purposes of viewing and measuring thread pitch and thread angles among others. | Remember | CO 11 |
| 4 | What is collimators? | A *collimator* is a device which narrows a beam of particles or waves. To narrow can mean either to cause the directions of motion to become more aligned in a specific direction (i.e., make collimated light or parallel rays), or to cause the spatial cross section of the beam to become smaller (beam limiting device). | Remember | CO 11 |
| 5 | What are the applications of the collimator? | Without a collimator, rays from all directions will be recorded; for example, a ray that has passed through | Understand | CO 11 |

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| | | the top of the specimen (to the right of the diagram) but happens to be travelling in a downwards direction may be recorded at the bottom of the plate. | | |
| 6 | What is an optical projector? | A *projector* is an *optical* device, which enlarges the image. This is the principle we are going to use it in the *Optical projector* comparator. This *Optical* Profile of *projectors* is used to check relatively small engineering components with the working standard. | Remember | CO 11 |
| 7 | Define Interferometers? | *Interferometers* are optical instruments used for measuring flatness and determining the length of slip gauges by direct reference to the wavelength of light. | Remember | CO 11 |
| 8 | Define screw thread micrometer? | The screw thread micrometer is designed to measure the pitch diameter of screw shreds up to 0.01mm of accuracy. The end of the anvil is the same as the screws thread to be measured. | Remember | CO 11 |
| 9 | show the errors in screw threads? | Errors in Threads. Errors in screw threads are related to the five elements of the screw threads. They are major diameter, minor diameter, pitch diameter, pitch and thread angle. | Understand | CO 12 |
| 10 | What are the measurement of effective diameter | Effective Diameter Measurements The effective diameter or the pitch diameter can be measured by any one of the following methods : (i) The micrometer method (ii) The one wire, two wires, or three wire or rod methods | Remember | CO 11 |
| 11 | What is angle of thread | The *thread angle* of a screw is the included *angle* between the *thread* flanks, measured in a plane containing the *thread* axis. | Remember | CO 11 |
| 12 | what is thread pitch diameter | The pitch diameter (often called the effective diameter) of a parallel thread is the diameter of the imaginary co-axial cylinder which intersects the surface of the thread in such a manner that the intercept on a generator of the cylinder, between the points where it meets the opposite flanks of a thread groove, is equal to half the nominal pitch of the thread. | Remember | CO 11 |
| 13 | what is profile thread gauges? | A thread gauge, also known as a screw gauge or pitch gauge, is used to measure the pitch or measuring instrument, rather it allows the user to determine the profile of the given thread and quickly categorize the thread by shape and pitch. | Remember | CO 11 |
| 14 | what is r.m.s value? | It is defined as the square root of the mean square (the arithmetic mean of the squares of a set of numbers). (1) The RMS is also known as the quadratic mean and is a particular case of the generalized mean with exponent | Remember | CO 12 |
| 15 | What is Rz value? | Rz is the difference between the tallest "peak" and the deepest "valley" in the surface. | Remember | CO 12 |

**Signature of Course Coordinator**

Dr. K Ch Apparao**,** Associate Professor **HOD, ME**