Hall Ticket No | | | | | | | | | | |  Question Paper Code:AMEC19

# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
(Dundigal-500043, Hyderabad)

**B.Tech V SEMESTER END EXAMINATIONS (REGULAR) - DECEMBER 2022**
**Regulation:UG20**

## MACHINE TOOLS AND METROLOGY

**Time: 3 Hours** **(MECHANICAL ENGINEERING)** **Max Marks: 70**

**Answer ALL questions in Module I and II**
**Answer ONE out of two questions in Modules III, IV and V**
**All Questions Carry Equal Marks**
**All parts of the question must be answered in one place only**

### MODULE – I

1. (a) Discuss about geometry of single point cutting tool. Explain the following:
   i) Rake angle ii) Clearance angle iii) Cutting angle [BL: Understand| CO: 1|Marks: 7]
   (b) In an orthogonal cutting experiment with a tool of rake angle $\alpha = 6^0$ , the chip thickness was found to be 3 mm when the uncut chip thickness was set to 1 mm. Find:
   i) Shear angle
   ii) Friction angle, assuming that Merchant's formula holds good. [BL: Apply| CO: 1|Marks: 7]

### MODULE – II

2. (a) How shapers are classified? Explain in detail manner about the quick return mechanism of ram in a shaper. [BL: Understand| CO: 2|Marks: 7]
   (b) 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 speed as 25 m/min, feed as 0.3 mm/rev and depth of cut is 2 mm. [BL: Apply| CO: 2|Marks: 7]

### MODULE – III

3. (a) What is a jig-boring machine? Describe its construction and working in detail with a neat sketch. [BL: Understand| CO: 3|Marks: 7]
   (b) Write short note on kinematics scheme of drilling and boring machine. Differentiate between up milling and down milling and explain their applications [BL: Apply| CO: 3|Marks: 7]

4. (a) Classify different types of drilling machines. Illustrate various tool holding devices of drilling machine with suitable sketches. [BL: Understand| CO: 4|Marks: 7]
   (b) Sketch and name the parts of a turret lathe. Describe the operations of the parts of the turret lathe. [BL: Apply| CO: 4|Marks: 7]

## MODULE – IV

5. (a) Why is a sine bar not used for generating angles greater than $45^0$, if high accuracy is needed? Explain it with a suitable graph. [BL: Understand| CO: 5|Marks: 7]

   (b) In an assembly of two parts of 70 mm nominal diameter the lower deviation of the hole is zero and upper deviation is 8 microns, while that of the shaft is -10 and -6 microns respectively. Estimate the allowance and type of fit. [BL: Apply| CO: 5|Marks: 7]

6. (a) Explain with a neat sketch the working mechanism of a gear and pinion type dial indicator. [BL: Understand| CO: 5|Marks: 7]

   (b) Calculate the cone angle of the taper plug gauge from the following data: Height of slip gauges, $h_1 = 49.456$, $h_2 = 35.678$ and length of sine bar = 125mm. [BL: Apply| CO: 5|Marks: 7]

## MODULE – V

7. (a) Identify the various errors in screw threads. Draw and explain the measurement of effective diameter of a screw thread using three wires. [BL: Understand| CO: 6|Marks: 7]

   (b) The heights of peak and valleys of 20 Successive points on a surface are 35, 25, 40, 22, 37, 19, 39, 21, 42, 18, 42, 24, 44, 25, 40, 18, 40, 18, 39, 20 microns respectively, measured over a length of 20mm. Determine CLA and RMS values of roughness surface. [BL: Apply| CO: 6|Marks: 7]

8. (a) With a sketch, explain the construction of autocollimator. Mention its applications. [BL: Understand| CO: 6|Marks: 7]

   (b) Discuss about best size weir. Determine the expression for the same in terms of the pitch and angle of the thread using two weir method. [BL: Apply| CO: 6|Marks: 7]