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

# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

**B.Tech V SEMESTER END EXAMINATIONS (REGULAR/ SUPPLEMENTARY) - FEBRUARY 2024**
**Regulation: UG20**

## MACHINE TOOLS AND METEROLOGY

**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) Enlist three types of chip formation during machining process. Differentiate oblique cutting and orthogonal cutting process. [BL: Understand| CO: 1|Marks: 7]

   (b) In an orthogonal cutting operation on a material with the shear yield strength of 250N/mm$^2$, the following data is obtained:

   Rake angle = 15 deg

   Uncut chip thickness = 0.25mm

   Width of chip = 2mm

   Chip thickness ratio = 0.46

   Friction angle = 40 deg

   Determine the shear angle, cutting force component and resultant force on the tool.

   [BL: Apply| CO: 1|Marks: 7]

### MODULE – II

2. (a) Describe in brief the important accessories of horizontal centre lathe machine. [BL: Understand| CO: 2|Marks: 7]

   (b) A cast iron block of a face area of 100mm x 150mm is to be machined on a shaper. The job is fixed keeping the dimension 150mm along the stroke. The ratio of forward speed to reverse speed is 0.7. Determine the time of machining the face and metal removal rate if the mean cutting speed is 20m/min, depth of cut is 3mm and table feed is 0.3mm/stroke. [BL: Apply| CO: 2|Marks: 7]

### MODULE – III

3. (a) Elaborate the types of indexing in milling machine. Differentiate up milling and down milling process. [BL: Understand| CO: 3|Marks: 7]

   (b) 12mm diameter holes are to be drilled in workpieces made of free machining steel to a depth of 50mm with HSS drills. Determine the time of drilling 100 pieces, if the job setup time is 30sec, drill setup time is 10sec and drill is required to be withdrawn after drilling 25mm for removal of chips, which takes 5sec. [BL: Apply| CO: 3|Marks: 7]

4. (a) Illustrate the kinematic scheme of drilling machine. Draw free hand sketches of five types of milling cutters. [BL: Understand| CO: 4|Marks: 7]

(b) A workpiece on a turret lathe is to be first drilled with a 15mm drill to a depth of 40mm, which requires withdrawal of chips after 20mm drilling and this takes 5sec. The hole is then enlarged by drilling with 22mm diameter to a depth of 30mm. The cutting speed for smaller drill is 25m/min and for bigger drill is 20m/min. The time of indexing for approach motion of turret is 10sec. Determine the time for drilling. [BL: Apply| CO: 4|Marks: 7]

## MODULE – IV

5. (a) Distinguish between

i) Interchangeable manufacturing and selective assembly.

ii) Measuring instrument and a gauge. [BL: Understand| CO: 5|Marks: 7]

(b) A hole and shaft have a basic size of 35mm and should have a clearance fit with a maximum clearance of 0.05mm and minimum clearance 0f 0.02mm. The hole clearance is to be 2 times the shaft tolerance. Determine

i) The tolerance of both and

ii) The limit for both hole and shaft using hole basis system. [BL: Apply| CO: 5|Marks: 7].

6. (a) Demonstrate the working principle of micrometer with a neat sketch.

[BL: Understand| CO: 5|Marks: 7]

(b) Determine the dimensions and tolerances of shaft and hole having size of 30 H7/h8 fit. Also determine the allowance (minimum clearance) and maximum clearance.

[BL: Apply| CO: 5|Marks: 7]

## MODULE – V

7. (a) Illustrate Autocollimator working principle and list its advantages. Write about angle of thread and thread pitch. [BL: Understand| CO: 6|Marks: 7]

(b) With the help of a neat sketch explain the construction, working and applications of Tool maker's microscope. [BL: Understand| CO: 6|Marks: 7]

8. (a) Describe the principle and operation of Taylor-Hobson Talysurf surface roughness instrument with a neat diagram. [BL: Understand| CO: 6|Marks: 7]

(b) In the measurement of surface roughness heights of 20 successive peaks and troughs were measured from a datum and were 35, 25, 40, 22, 35, 18, 42, 25, 35, 22, 36, 18, 42, 22, 32, 21, 37, 18, 35, 20 microns. If these measurements were obtained on 20mm length, determine CLA and RMS values of rough surface. [BL: Apply| CO: 6|Marks: 7]

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