Code No: R2031033 **R20** SET - 1

III B. Tech I Semester Regular/Supplementary Examinations, December -2023
MACHINING, MACHINE TOOLS & METROLOGY
(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1. a) Explain the construction of merchant force diagram. [8M]
   b) Explain the use of chip breakers in metal cutting. [6M]

(OR)

2. a) A seamless tubing 40 mm outside diameter is turned orthogonally on a lathe. The following data available: rake angle 30^0, cutting speed 18 m/min, feed 0.15 mm/rev, length of continuous chip in one revolution is 50 mm, cutting force 2000 N, feed force 800 N. Calculate the coefficient of friction, shear plane angle, velocity of chip along toll face and chip thickness. [8M]
   b) Illustrate the importance of various Single point cutting tool angles. [6M]

UNIT-II

3. a) Diagrammatically explain the thread cutting on the lathe machine. [7M]
   b) State the advantages, limitations, and applications of a shaper. [7M]

(OR)

4. a) Name the different types of lathe operations? Explain about facing and knurling with neat sketches. [7M]
   b) Enumerate the various operations which can be performed on a planer. Explain any two. [7M]

UNIT-III

5. a) Define the cutting speed, feed and machining time for drilling. [7M]
   b) What is milling machine? What are the operations performed on a milling machine. [7M]

(OR)

6. a) Explain briefly with sketches any four of the drilling operations. [7M]
   b) What is the difference between up milling and down milling? Which one is preferred in certain situations and which one is preferred in other situations? [7M]

UNIT-IV

7. a) Describe the construction and working of a tool and cutter grinding. [7M]
   b) Differentiate between 'Hole basis system' and 'Shaft basis system' of fits. [7M]

(OR)

8. a) Define Maximum, Minimum Metal limits and Maximum, Minimum clearances with the help of neat sketches. [7M]
   b) What are the advantages, limitations, and applications of broaching? [7M]

UNIT-V

9. a) Discuss the principal reasons for controlling the surface texture. [6M]
   b) With the aid of a neatly labeled diagram explain any one of the optical comparator. [8M]

(OR)

10. a) Explain working principle of optical projector and write their uses. [7M]
    b) Describe the method of evaluating roughness using [7M]
    (i) Peak to valley high method. (ii) C.L.A. method.

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All Questions Carry Equal Marks
*****

UNIT-I

1. a) Define cutting speed, feed, depth of cut and tool life. [6M]
   b) Discuss tool wear mechanism in cutting tool. [8M]

(OR)

2. a) What are the characteristics of coolants during machining? List out the different types of cutting coolants. [7M]
   b) In an orthogonal cutting process, following data were observed; chip length of 75 mm was obtained with an uncut chip length of 180 mm and the rake angle used was 23^o and depth of cut is 0.45mm. The horizontal and vertical components of cutting force were 2500 N and 250 N respectively. Determine the shear angle, friction angle and resultant cutting force. [7M]

UNIT-II

3. a) Explain with neat sketch hydraulic shaper Quick return mechanism. [7M]
   b) What are the different types of tapers turning methods? Discuss any one method with suitable diagram. [7M]

(OR)

4. a) Explain lathe machine accessories with neat sketches. [7M]
   b) What is a shaper? What is the working principle and specification of a shaper? [7M]

UNIT-III

5. a) Draw a neat sketch of a twist drill and explain the nomenclature. [7M]
   b) What is the difference between compound indexing and differential indexing? Explain the relative merits. [7M]

(OR)

6. a) Discuss briefly with neat sketch, a horizontal boring machine. [7M]
   b) Explain briefly Up-milling process and Down milling process. [7M]

UNIT-IV

7. a) How grinding machines are classified? Explain plain cylindrical grinding machine with neat sketch. [8M]
   b) Distinguish between interchangeable assembly and selective assembly. [6M]

(OR)

8. a) What are the different types of gauges? Explain any four limit gauges. [7M]
   b) What is broaching. Sketch a broach and indicate the salient nomenclature. [7M]

UNIT-V

9. a) Explain with the help of neat sketches the principle and construction of an auto collimator. [7M]
   b) Explain the working of any one of surface roughness measuring instrument. [7M]

(OR)

10. a) In the measurement of surface roughness heights of successive 10 peaks and troughs were measured from a datum and were 33, 25, 30, 19, 22 18, 27, 29 and 20 microns. If these measurements were obtained on 10mm length, determine CLA and RMS values of surface roughness. [7M]
    b) With a neat sketch, explain tool makers microscope [7M]

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Answer any **FIVE** Questions **ONE** Question from **Each unit**
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UNIT-I

1. a) Explain the formation of chip. Discuss the types of chips with neat sketches. [8M]
   b) In an orthogonal cutting operation on a material with yield strength of 275 N/mm^2. The following data is obtained. [6M]
   Rake angle of the tool = 15^0
   Uncut chip thickness = 0.25mm
   Width of chip = 2mm
   Chip thickness ratio= 0.46
   Friction angle = 40^0
   Determine the shear angle, the cutting force component and resultant force on the tool.

(OR)

2. a) The taylor's tool life equation for machining work piece of C-40 steel with a 18-4-1 HSS cutting tool at a feed of 0.2 mm/min and depth of cut of 2 mm is given by $VT^n = C$, Where n and C are constants. The following V and T observations have been noted. [7M]

V_i m/min	25	35
T_i min	90	20

   Calculate (i) n and C (ii) Hence recommended the cutting speed for a desire tool life of 60 min.
   b) Explain briefly orthogonal and oblique cutting with neat sketch. [7M]

UNIT-II

3. a) Name the different types of lathe operations explain any two. [7M]
   b) Draw the block diagram of a slotting machine and explain briefly its principal parts. [7M]

(OR)

4. a) Discuss about the lathe attachments with neat sketches. [7M]
   b) Distinguish between planer, shaper and slotter machines. [7M]

UNIT-III

5. a) Differentiate between Drilling and boring operations. [7M]
   b) What is the principle of working of a milling machine? How do you classify the milling machine? [7M]

(OR)

6. a) Name the various operations performed on a drilling machine. Explain any two. [8M]
   b) Find the time required to drill 6 holes in a casted flange of each of 9 mm depth, if the hole diameter is 14mm. Assume cutting speed as 25 m/min and feed as 0.25 mm.rev. [6M]

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UNIT-IV

7. a) Give the advantages and limitations of honing and lapping. [7M]
   b) Mention various types of bonds used in making of grinding wheel also mention their application. [7M]

(OR)

8. A hole and shafting system has the following dimensions $50[H_8/c_8]$. The standard tolerance is given by $i=0.45(D)^{1/3}+0.001D$, where D=diameter(mm) of geometric mean of steps i=standard tolerance, microns. The multiplier for grade IT8 is 25i. The fundamental deviation for shaft c, for D>40mm is given by –(9.5+0.8D) microns. The diameter range lies between 50 to 80mm. Sketch the fit and show these upon the actual dimension of hole and shaft. [14M]

UNIT-V

9. a) Describe the working principle of profilograph? [7M]
   b) Describe the basic principle of optical comparator with a neat sketch. [7M]

(OR)

10. a) Explain with a neat sketch the principle of Optical projector. [7M]
    b) What is surface finish? Describe the elements of surface texture. [7M]

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Code No: R2031033 **R20** SET - 4

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UNIT-I

1. a) In an orthogonal turning operation, cutting speed is 75 m/min. Cutting force 25 kg. Feed force 10 kg. Back rake angle 15^0, feed 0.2 mm/rev and chip thickness 0.4 mm. Determine the following: [6M]
   (i) Shear angle (ii) work done in shear (iii) shear strain
   b) Explain various types of chip breakers with neat sketches. [8M]

(OR)

2. a) What factors influence the formation of the built up edge and list out the factors to decrease the built up edge? [7M]
   b) Discuss briefly the following tool materials: (i) High speed steels and (ii) Cemented Carbides. [7M]

UNIT-II

3. a) What are the various methods available for taper-turning in a lathe? Explain their specific advantages and limitations. [7M]
   b) Sketch and Explain the working of Planer. [7M]

(OR)

4. a) Give the specification of a lathe. [6M]
   b) Draw the block diagram of a shaper machine and explain briefly its various parts and operations performed [8M]

UNIT-III

5. a) Explain the geometry of milling cutters. [7M]
   b) Write short notes on (i) Face milling (ii) Straddle milling and (iii) End milling. [7M]

(OR)

6. a) A 25 mm deep slot is to be milled with a 80 mm diameter cutter. The length of the slot is 400mm. What will be the total table travel to complete the cut. If the cutting speed is 25 rpm and feed/tooth is 0.2mm, calculate the milling time. The cutter has 25 teeth and one cut is sufficient for the slot. [7M]
   b) What do you understand by the term "Boring"? How are boring machines classified? [7M]

UNIT-IV

7. a) Describe Cylindrical grinding machine with neat sketch [7M]
   b) Explain briefly different types of fits with necessary sketches? [7M]

(OR)

8. a) What is broaching. What shapes can be made by broaching. List its uses. [7M]
   b) What are the different types of limit gauge? Explain any five limit gauges. [7M]

UNIT-V

9. a) Explain the working principle of Talysurf with schematic layout. [7M]
   b) With the help of a neat sketch explain the construction and working of optical flat. [7M]

(OR)

10. a) Explain the following methods of qualifying surface roughness: [7M]
    (i) Ra value. (ii) RMS value. (iii) Rz value.
    b) Explain with the help of neat sketches the principle and construction of an auto collimator. [7M]

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