

III B. Tech I Semester Regular Examinations, Dec/Jan -2022-23
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

UNIT-I

1. a) Differentiate between orthogonal and oblique cutting in metal cutting process. [7M]
b) Draw merchant circle diagram for metal cutting process and derive relations for various forces in metal cutting. [7M]

(OR)

2. a) What is chip thickness ratio? Derive the relation for shear angle with chip thickness ratio and rake angle. [7M]
b) What are types of chips? Explain which type is preferable and why? [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) Give a schematic sketch of a shaper labeling the important parts and their functions [7M]

(OR)

4. a) Briefly explain about different operations performed in a slotter with neat sketches [7M]
b) Explain the different parts of planner machine with neat sketch [7M]

UNIT-III

5. a) Explain the differences between drilling, the reaming and tapping. [7M]
b) What is the difference between face milling and end milling? Explain. [7M]

(OR)

6. a) Draw neat sketch of boring machine and label all the parts [7M]
b) Explain different types of indexing methods with example [7M]

UNIT-IV

7. a) Explain Pull broaching and Push broaching [7M]
b) A 50 mm diameter shaft and bearing are to be assembled with a clearance fit. The tolerance and allowance are as follows. [7M]
Allowance = 0.035 mm
Tolerance on hole = 0.025 m
Tolerance of shaft = 0.017 mm.
Find the limits of size for the hole and shaft if a hole basis system is used.

(OR)



8. a) How grinding wheel is specified? Explain in detail. [7M]
b) Determine and sketch the limits of tolerance and allowance for a 42 mm shaft and hole pair designated as H8-g10. The basic size lies in the range of 30–50 mm. The multipliers for grades 8 and 10 are 25 and 64 respectively. The fundamental deviation for g shaft is $(- 2.5 D^{0.34})$ microns. The standard tolerance unit is $i=0.45 (D)^{1/3} + 0.001D$ in microns. [7M]
- UNIT-V**
9. a) Describe the working principle of profilograph with neat sketch [7M]
b) Describe with a neat sketch the principle of working of an auto-collimator. Explain how flatness of the surface is determined with help of an auto-collimator? [7M]
- (OR)
10. a) The heights of peaks and valleys of 20 successive points on a surface are 35, 25, 40, 22, 37, 19, 41, 21, 42, 18, 42, 24, 44, 25, 40, 18, 40, 18, 39, and 21 microns respectively, measured over a length 20mm. Determine CLA and RMS values of roughness surface. [7M]
b) Describe the working of a profile projector. What are its applications? [7M]



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UNIT-I

1. a) What are the desirable properties of cutting fluids used in metal cutting? Explain [7M]
b) What are the various forms of wear found in cutting tools? Show with a neat sketch [7M]

(OR)

2. a) What is meant by built up edge in metal cutting? When it is formed? How to avoid it? [7M]
b) Explain, how you will compute various 'cost components' and 'Total Production Cost' of a machined work piece. [7M]

UNIT-II

3. a) Describe the operation of quick return motion in mechanical shaper? [7M]
b) Explain the different parts of slotting machine with neat sketch? [7M]

(OR)

4. a) What are the differences between a Turret and a Capstan lathe? [7M]
b) Draw a neat sketch of a planer and label its various parts [7M]

UNIT-III

5. a) List various types of drilling machine and explain with a neat sketch gang drilling machine [7M]
b) What you understand by (i)Gang milling,(ii)Straddle milling and (iii)String Milling? [7M]

(OR)

6. a) List the work holding devices used for holding work on a drilling machine and explain with neat sketch any three. [7M]
b) Explain up-milling and down-milling. List down the advantage of up milling. [7M]

UNIT-IV

7. a) What is an abrasives? How are abrasive classified? Enlist and explain various abrasive used in grinding wheels. [7M]
b) Determine limit dimensions for a clearance fit between mating parts of diameter 40 mm, providing a minimum clearance of 0.10 mm with a tolerance on the hole equal to 0.025mm and on shaft 0.05mm using both systems. [7M]

(OR)

8. a) Explain about cylindrical grinding machine with neat sketch? [7M]
b) Differentiate between interchangeable assembly and selective assembly, with suitable examples. [7M]



UNIT-V

9. a) Discuss the following terms in connection with surface finish measurement: (i) Waviness, (ii) Lay, (iii) Roughness, (iv) Centre line profile (v) RMS (vi) 10 point height of irregularities [7M]
- b) Explain the applications of Tool Maker's microscope with appropriate sketches. [7M]
- (OR)
10. a) 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 and 20 microns. If these measurements were obtained over a length of 20 mm. Determine the CLA and RMS value of the rough surface. [7M]
- b) What is an optical flat? Explain the process of finding flatness of various types of surfaces [7M]



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UNIT-I

1. a) Classify various machining processes and explain each in brief [7M]
b) What is chip thickness ratio? Derive the relation for shear angle with chip thickness ratio and rake angle. [7M]

(OR)

2. a) Explain the various functions and requirements of a coolants during machining. [7M]
b) Why are chip breakers necessary? Explain the adverse effects that they can produce on work, tool and surroundings. Also, elaborate the common methods of chip breaking. [7M]

UNIT-II

3. a) Explain the advantages and disadvantages of a turret lathe. [7M]
b) Explain Shaper feed mechanism with neat sketch. [7M]

(OR)

4. a) Explain function of principal part of slotter. [7M]
b) Draw a neat sketch of a planer and label its various parts. [7M]

UNIT-III

5. a) Explain nomenclature of twist drill with neat sketch. [7M]
b) Write classification of milling machine. Explain principal parts of column & knee type horizontal milling machine with neat sketch [7M]

(OR)

6. a) Explain Radial drilling machine with neat sketch [7M]
b) What is indexing? Explain and discuss various type of Indexing [7M]

UNIT-IV

7. a) What is super finishing? Explain any one super finishing operation with sketch. [7M]
b) Distinguish between hole basis system and shaft basis system. [7M]

(OR)

8. a) What is lapping? Explain its application with sketch. [7M]
b) Explain Taylor's Principle as applicable to limit gauging with sketches. [7M]



UNIT-V

9. a) Explain with a neat sketch, the principle and working of Talysurf surface roughness tester for the measurement of surface finish. [7M]
b) What are various optical comparators? Explain any one with neat sketch. [7M]

(OR)

10. a) Explain following methods of specifying roughness value: i) Peak-to-valley height method ii) Centre-line-average method iii) Root mean square method. [7M]
b) Explain how thread angle is measured using Tool Maker's microscope. [7M]



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UNIT-I

1. a) What are the various forms of wear found in cutting tools? Show [7M]
with a neat sketch.
- b) How is tool life influenced by the following factors? [7M]
i) Tool material ii) Workpiece material iii) Rigidity of the machine tool.

(OR)

2. a) Explain various cutting tool angles with the help of neat sketch. [7M]
- b) List out various cutting tool materials and their applications. [7M]

UNIT-II

3. a) Explain briefly the following lathe operations: [7M]
Facing ii) Threading iii) Knurling iv) Forming.
- b) Sketch and describe any one quick return mechanism of shaper. [7M]

(OR)

4. a) Draw the block diagram of a slotting machine and explain briefly [7M]
its principal parts.
- b) State the purpose of each part on lathe: (i) Face Plate, (ii) Lead [7M]
screw, (iii) Steady rest, (iv) Chasing dial, (v) Mandrel, (vi) Split nut

UNIT-III

5. a) Explain Tapping, Trepanning and Countersinking. [7M]
- b) Draw neat sketch of jig boring machine and label the parts. [7M]

(OR)

6. a) List out the various operation carried out on drilling machine. [7M]
Explain any four.
- b) What is indexing? Explain and discuss various type of Indexing [7M]

UNIT-IV

7. a) What are the advantages, limitation and application of broaching [7M]
- b) Explain the need for providing tolerance on a dimension. Also, [7M]
differentiate between unilateral and bilateral tolerance with examples.

(OR)



8. a) Explain about cylindrical grinding machine with neat sketch? [7M]
b) Design the general type GO gauges and NOGO gauges for components having 20H7/f8 fit. Given Gauge tolerance =work tolerance =10% of work tolerance. Assume the data following: Upper deviation of shaft 'f' is $-5.5D^{0.41}$, The standard tolerance unit $i=0.45 D^{1/3}+0.001D$, where D is the geometric mean of the lower and upper limits of diameter step in which the diameter consideration lies. D is in mm. 20mm falls in diameter steps of 18-30mm. The standard tolerance for IT7=16i and IT8=25i.

UNIT-V

9. a) Describe various methods of numerical assessment of surface finish. [7M]
b) Explain the principle of auto collimator in finding the flatness of any object. [7M]
- (OR)
10. a) Describe with a neat sketch the construction, principle and operation of Talysurf. [7M]
b) What are the principal parts of an optical projector? Explain its working with neat sketch. [7M]

