

Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(ME)/SEM-5/ME-504/2010-11

2010-11

TECHNOLOGY OF MACHINING

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

i) By machining, products are

- | | |
|-------------------|-------------------|
| a) preformed | b) semi-finished |
| c) super-finished | d) none of these. |

ii) In shaping and planing machines, feed is expressed by

- | | |
|------------------|-----------|
| a) mm/revolution | b) mm/min |
| c) mm/stroke | d) m/min. |

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- iii) In centre lathes, the workpiece is mounted
 - a) in between the centres
 - b) in self centering chuck
 - c) in four independent jaw chucks
 - d) any of these.
- iv) In machine shops, jigs and fixtures are used for
 - a) piece production b) batch production
 - c) mass production d) all of these.
- v) An axial straight through hole cannot be produced in a mild steel disc in a
 - a) centre lathe b) turret lathe
 - c) drilling machine d) milling machine.
- vi) Merchant's circle diagram (MCD) in machining deals with
 - a) cutting force components
 - b) mechanism of chip formation
 - c) cutting tool geometry
 - d) cutting temperature.

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- vii) Cutting tool materials should essentially possess
- a) enough fracture toughness
 - b) high hardness
 - c) high hot strength
 - d) all of these.
- viii) Both the cutting motion and feed motion are imparted to the cutting tool in
- a) horizontal boring machine
 - b) vertical boring machine
 - c) centre lathe
 - d) broaching machine.
- ix) Capstan and turret lathes are
- a) non-automatic
 - b) semi-automatic
 - c) fully automatic
 - d) none of these.
- x) In centreless grinding, the blanks are mounted
- a) in self-centering chuck
 - b) in between centres
 - c) in collets
 - d) none of these.

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- xi) During machining, the cutting tools travel are controlled by several cams in
- a) centre lathe
 - b) capstan lathe
 - c) turret lathes
 - d) single spindle automatic lathes.
- xii) The teeth of internal spur gears are produced by machining in
- a) milling machine
 - b) gear hobbing machine
 - c) gear shaping machine
 - d) planing machine.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. State the basic purposes of machining and grinding.
3. Distinguish between drilling and boring w.r.t. tool-work motions and purposes.
4. Why does machining chip become thicker after cut ?

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5. How are straight and taper shank drills mounted in the spindle of drilling machines ?
6. Sketch a single point turning tool and show its orthogonal rake angle, inclination angle and the cutting edge angles.
7. How is a grinding wheel specified ?
8. How are the cutting tools made to move axially and transversely in single spindle automatic lathes.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

9. a) Derive an expression of shear plane angle by the principle of Merchant's model in orthogonal cutting. 8
- b) In orthogonal cutting operation, following data have been observed :

Uncut chip thickness = 0.127 mm, width of cut = 6.35 mm, cutting speed = 2m/s, rake angle = 10° , cutting force = 567N, thrust force = 227N, chip thickness = 0.228 mm.

Calculate the following :

- i) Shear angle
- ii) Friction angle
- iii) Shear stress
- iv) Cutting power
- v) Chip velocity
- vi) Shear strain
- vii) Shear strain rate.

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10. a) What is tool life ? Explain the main types of tool failure criteria. 2 + 3

- b) The following equation for tool life is given for a turning operation :

$$VT^{0.13} f^{0.77} d^{0.37} = C.$$

A 60 minute tool life was obtained while cutting at $V = 30$ m/min, $f = 0.3$ mm/rev & $d = 2.5$ mm

Determine the change in tool life if the cutting speed, feed & depth of cut are increased by 20% individually & also taken together. 7

- c) What are the conditions favourable for Built-up Edge formation ? 3

11. a) Explain the following with aid of neat sketches : 4 + 4

- i) Gear hobbing
- ii) Gear shaping.

- b) What is indexing related to milling ? Explain the working principle of plain & differential indexing system with the help of sketches. 2 + 5

12. a) With the aid of neat sketches, explain the following : 4 + 4

- i) Superfinishing of small shaft like components
- ii) Honing of hole.

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- b) Explain centreless grinding with a sketch showing different elements on it. 5
- c) A grinding wheel is specified as 49A36M7V24. Explain the specifications. 2
13. a) What is the difference between Jigs & Fixtures ? Explain 3-2-1 locating principle. 3 + 4
- b) Explain the advantages of using steady rest & follower rest with the aid of a sketch. 8

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