

CS/B.Tech/ME/EVEN/SEM-6/ME-602/2015-16



**MAULANA ABUL KALAM AZAD UNIVERSITY OF
TECHNOLOGY, WEST BENGAL**

Paper Code : ME-602

MACHINING PRINCIPLES & MACHINE TOOLS

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 the following :

10 × 1 = 10

i) Tool wear in carbide tool takes place due to

- a) diffusion b) adhesion
- c) abrasion d) all of these.

ii) In Milling machine, the cutter is held in

- a) tool post b) arbor
- c) clapper box d) indexing head.

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iii) Tool life is most affected by

- a) cutting velocity
- b) tool geometry
- c) hardness of the workpiece
- d) all of these.

iv) The chip reduction ratio is defined as the ratio of

- a) chip thickness to uncut chip thickness
- b) uncut chip thickness to cut chip thickness
- c) uncut chip width to cut chip width
- d) velocity of cutting to tool life.

v) Dynamometers are used to measure the

- a) cutting velocity b) cutting forces
- c) chip thickness d) volume of metal cut.

vi) A grinding wheel is specified by

- a) grain size b) grit size
- c) grade d) all of these.

vii) Cemented carbide tools are generally provided with

- a) positive back rake angles
- b) negative back rake angles
- c) zero back rake angles
- d) none of these.

- viii) Chip reduction coefficient is
- always less than 1.0
 - equal to or less than 1.0
 - more than 1.0
 - none of these.
- ix) In cutting tools, crater wear develops at
- the rake surface
 - the principal flank
 - the auxiliary
 - the tool nose.
- x) Knurling operation is done in
- lathe
 - drilling machine
 - milling machine
 - slotting machine.

GROUP – B

(Short Answer Type Questions)

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

- It is required to cut a thread of 1.25 mm pitch in a lathe having pitch of the lead screw as 6 mm. Find the change gear arrangements. Assume that gears are available from 20 teeth to 120 teeth in step of 5 and one extra gear having teeth of 127. Sketch the gearing arrangements.
- What is tool life ? Mention the various factors affecting tool life. Explain with sketch, crater wear. How is it measured ? $1 + 2 + 2$

- State the basic difference between conventional machining and grinding. Distinguish between drilling and boring with respect to purpose, tool work motion and chip formation. $2 + 3$
- How a cutting tool is designated in ORS and ASA system ? Sketch a single point turning tool and show its salient features in ORS. $2\frac{1}{2} + 2\frac{1}{2}$
- What are the advantages and limitations of Merchant's circle diagram ? What assumptions are made for Merchant's circle diagram ? $2 + 1 + 2$
- Why are speeds of a machine tool arranged in GP ?
 - State the use of ray diagram and show an example of it. $2 + 3$

GROUP – C

(Long Answer Type Questions)

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

- 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

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- iii) Shear stress
- iv) Cutting power
- v) Chip velocity
- vi) Shear strain. 10
- b) Briefly explain various types of taper turning methodology in a centre lathe. 5
- 9. a) Explain the following with aid of neat sketches :
 - i) Gear hobbing
 - ii) Gear shaping. 4 + 4
- b) What is indexing in related to milling ? Explain the working principle of plain & differential indexing system with help of sketches. 2 + 5
- 10. a) With the aid of neat sketches, explain the following :
 - i) Super finishing of small shaft like components
 - ii) Honning of hole. 4 + 4
- 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

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- 11. a) Give a neat sketch of kinematic structure of standard shaper machine and explain its major components and their functions. 10
- b) Find the time required on a shaping machine for completing one cut on a plate (200 × 300) mm², if the cutting speed is 10 m/minutes. The return time to cutting time ratio is 2:3. Assume the following approach = 50 mm. Over travel 25 mm, allowance on either side of the plate width = 5 mm, feed per cycle = 1 mm. 5
- 12. a) Prove that, $\tan \beta = \frac{\cos \gamma_0}{\xi - \sin \gamma_0}$, where β = Shear angle, γ_0 = Rake angle and ξ = Chip reduction coefficient. 5
- b) The following observations were made while turning MS rod with 80 mm diameter in a centre lathe ;
Cutting speed = 30 m/min,
Feed = 0.2 mm/rev
Depth of cut = 0.25 mm
Tool life = 80 min
Tool life equation follows as : $VT^{0.10} f^{0.6} d^{0.25} = C$
If the cutting speed, feed & depth of cut are increased by 25% respectively, what is its effect on tool life ? 5
- c) A grinding wheel is specified with the following marking :
49 A 36 M 8 V 24
Explain the specification. 5

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13. a) What are the sources of Generatrix and Directrix ?
2
- b) Explain Generatrix and Directrix with neat sketch for the following operations (any two) : 3 + 3
- i) Gear Hobbing
 - ii) Thread milling
 - iii) Turning.
- c) Why Broaching is called progressive cutting ?
Explain Broaching with neat sketch. 2 + 3
- d) What are the major components of a Planning Machine ? 2

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