

CS/B.TECH/PWE/SEM-8/PWE-804A/2013

2013

**TECHNOLOGY OF MACHINING & METAL
CUTTING**

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 :

10x1 = 10

i) The strength of a single point cutting tool depends upon

- a) rake angle b) clearance angle
- c) lip angle d) inclination angle.

ii) The composition of commonly used HSS is

- a) 18 W 4 Cr 1 V
- b) 12 Mo 1 W 4 Cr 1 V
- c) 6 Mo 6 W 4 Cr 1 V
- d) none of these.

iii) A milling cutter having 8 teeth is rotating at 150 r.p.m.

If the feed per tooth is 0.1 mm the value of the table
speed in mm/min is

- a) 120 b) 187
- c) 125 d) 70.

iv) Crater wear on tool always starts at some distance from
the tool tip because at that point

- a) cutting fluid does not penetrate
- b) normal stress on rake surface is maximum
- c) temperature is maximum
- d) tool strength is minimum.

- v) Size of a shaper is given by its
- a) stroke length
 - b) motor power
 - c) weight of the machine
 - d) rate size.
- vi) In centreless grinding the workpiece centre will be
- a) above the line joining the two wheel centres
 - b) below the line joining the two wheel centres
 - c) one the line joining the two wheel centres
 - d) none of these.
- vii) A lead screw with half nut in a lathe, free to rotate in both direction has
- a) V threads b) Whitworth thread
 - c) Buttress thread d) Acme thread.
- viii) In machining high carbon steels under the same cutting conditions, cutting temperatures would be minimum if the tool insert is made of
- a) sintered carbide
 - b) silver toughed alumina
 - c) CBN
 - d) Diamond (PCD).
- ix) Merchant's circle diagram is valid for
- a) orthogonal cutting b) oblique cutting
 - c) both of these d) none of these.
- x) Cutting tools were essentially provided with clearance angle
- a) for ease of chip flow
 - b) to reduce cutting forces
 - c) to avoid rubbing with the finished surfaces
 - d) to reduce friction at chip-tool interface.
- xi) The point angle of a drill is

- a) 60 degree b) 90 degree
c) 118 degree d) 235 degree.
- xii) CBN wheel are preferably used to grind the products made of
- a) grey cast iron b) mild steel
c) wrought iron d) hard steel.

GROUP – B

(Short Answer Type Questions)

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

2. Write the names of the cutting fluids. State their properties and roles in metal cutting.
3. What are the major causes of tool failures ? How do you prevent these failures ?
4. a) Find the set over of tail stock in taper turning.
b) Calculate the teeth of change gears to cut 4 T.P.I. on a lathe, with lead screw, having pitch equal to 11 mm,
5. A drilling machine consumes 0.5 kW of power while machining at speed of 40 m/min. The torque developed was measured with a dynamometer and comes to be 2 Nm. What is the maximum diameter of the drill under the above conditions. Find also the machining time if the depth of the hole to be cut is 30 mm at a feed of 0.1 mm/rev.
6. Write a note on any *one* of the following :
 - a) Different tool materials and its role
 - b) Jigs and Fixtures
 - c) Thread cutting in a lathe.

GROUP – C

(Long Answer Type Questions)

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

7. a) Derive the relations between the ORS system and ASA system in tool geometry of a single point cutting tool.

And hence find the side rake, back rake, and maximum rake angle of a single point turning tool with a tool geometry in ORS system as 10-0-5-8-20-90-0 (mm).

5 + 3

b) Define tool life. A tool life of 100 min is recorded in a machining test while machining at 25 m/min and 6 min at 70 m/min of mild steel work-piece. Establish the tool life equation, cutting speed for 1 min tool life and also find how many times the tool has to be regrind if it is used to turn a job of length 250 mm at a speed of 500 r.p.m. at a feed of 0.2 mm/rev. 1 + 6

8. a) Discuss how the tool geometry affects the tool life. 8

b) Determine the cost of machining 10 identical jobs by milling under the given conditions :

Idle time per piece = 10 min, actual machining time per piece = 20 min, Life of each tool = 10 min, time of changing a tool tip = 2 min, man machinne per hour rate = Rs. 60, cost of each new tool tip = Rs. 20. 7

9. a) Derive the Earnst and Merchant relation in metal cutting. 7

b) During the machining of steel with 0-10-6-6-8-90-1 (mm) ORS shaped tool the following observations were taken : Feed = 0.5 mm/rev, depth of cut = 2 mm, cutting speed = 40 m/min, the shear angle = 20°, the power consumption while machining is 3 kW and while running idle is 0.5 kW. Calculate the cutting force, chip thickness ratio, normal pressure of the chip and velocity of chip flow. 8

10. a) Write the differences between Broaching and grinding.

5

b) Calculate the total time to mill a slab by peripheral

milling for the given data :

Cutter diameter = 50 mm, Feed = 0.3 mm/min, depth of cut = 2 mm, length of the job = 100 mm, over travel = 3 mm. 3

c) During peripheral surface grinding operation with a 200 mm 20 mm wheel rotating at 3000 r.p.m. with table speed of 2 m/min the following observations have been made : Wheel depth of cut = 0.025 mm, Tangential force = 2 kg. Thrust force = 1.5 kg.

Calculate the specific energy per unit volume. Given the number of active grits as 300 per sq.cm and width of workpiece = 10 mm. 7

11. a) Do the differential indexing for 149 division. 4

b) What is a gear ? What are the types of gear ? Write the advantages of involute gear tooth form. Explain any machining process of manufacturing a gear.

1 + 2 + 3 + 5

12. Write short notes on any *three* of the following : 3 5

a) Principles of location

b) Differences between Capstan and Turret lathe

c) Comparison between NC and CNC machines

d) Counter boring and counter sinking

e) Thread rolling.

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