Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH/AUE (NEW)/SEM-5/AUE-505/2013-14

2013

MACHINE TOOLS AND MACHINING TECHNOLOGY

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 : $10 \times 1 = 10$

i) Continuous chips will be formed when machining speed is

a) high

b) low

c) medium

d) irrespective of cutting speed.

ii) Which of the following is non-chip removal process ?

a) Spinning on lathe b) Milling

c) Thread cutting d) Gear hobbing.

iii) Crater wear occurs mainly due to which of the following phenomenon ?

a) Abration b) Diffusion

c) Oxidation d) Adhesion.

iv) The purpose of the tumbler gears in lathe is to

a) cut gears

b) cut threads

c) reduce spindle speeds

d) give desired direction of movement to lathe carriage.

v) Tungsten content in high speed steel cutting tool material is

a) 18% b) 4%

c) 1% d) 16%.

vi) In electro-discharge machining, the tool is made of

a) Tungsten carbide b) Heat treated alloy steel

c) Diamond d) Brass or copper.

vii) Chromium in HSS cutting tool material is

a) 1% b) 4%

c) 18% d) 0.6%.

viii) Which of the following is fastest method of cutting gears ?

a) Milling

b) Gear shaping

c) Gear hobbing

d) Gear burnishing.

ix) The purpose of reaming is

a) making a hole initially

b) to enlarge diameter of the hole

c) to improve finish of the hole

d) to achieve correct diameter.

x) In electro-chemical machining, best surface finish is obtained with

a) low current density

b) high current density

c) slow rate of metal removal

d) high rate of metal removal.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What are the functions of rake angle in a single point cutting tool ? Discuss on advantages of providing negative rake in a single point cutting tool. Explain cutting tool signature with a suitable example. 2 + 2 + 1

3. Derive an expression for shear angles in a single point cutting tool.

4. What is indexing ? Explain with neat sketch the working of universal dividing head during indexing. 1 + 4

5. Describe twist drill nomenclature using neat sketches.

6. Discuss the process parameters of abrasive jet machining with suitable figure.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Describe with neat sketch tool angles and cutting tool nomenclatures.

b) Show schematically merchant's force circle in orthogonal cutting and derive the equations for shear and friction forces. Also establish the relationship between shear angle, rake angle and friction angle for minimum cutting energy consumption.

c) In an orthogonal cutting experiment with tool of rake angle $\nu = 7°$, chip thickness was found to be 2.5 mm when uncut chip thickness was set to 1 mm. Find the following : i) shear angle (β) ii) friction angle (λ) assuming that Merchant's formula holds good. 5 + 7 + 3

8. a) State generalized Taylor's tool life equation. Discuss on the parameters that affecting tool life.

b) Derive an expression for economic tool life using Gilbert's model.

c) a seamless tube of 35 mm diameter turned in a lathe with an orthogonal tool of rake angle $\nu = 10°$, longitudinal feed 0.1 mm/rev, length of chip/rev is 50 mm, cutting velocity is 2m/s. Calculate shear angle, chip thickness, chip velocity and shear velocity.

d) What are the desirable characteristics of a cutting fluid ? 3 + 5 + 5 + 2

9. a) Explain with neat sketch the function of a back gear in belt driven lathe headstock.

b) Name different methods of taper turning. Explain the method of taper turning by taper turning attachment.

c) A shaft 1200mm long has a taper of 1/200 for a length of 600 mm. Maximum diameters of the shaft 75 mm. Determine minimum diameters of shaft and amount of set over.

d) Determine and draw the gearing arrangement for cutting, a screw having 9mm pitch on the lathe having lead screw of 4 TPI. 5 + 5 + 2 + 3

10. a) Distinguish between the following :

i) Plain milling and universal milling

ii) Face milling and Side milling

iii) Gang drilling machine and multi spindle drilling machine.

b) Calculate the change gears for indexing to give 83 divisions.

c) How the drill bit can be specified ? Explain with an example. (2 × 3) + 6 + 3

11. a) Describe with diagram how material is removed in EDM process.

b) With neat sketches discuss the working principle of main components of an ultrasonic machining.

c) Explain with neat sketch the working principle of plasma arc machining. 5 + 5 + 5