http://www.makaut.com

Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH/AUE(N)/SEM-5/AUE-505/2012-13

2012

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) Laser beam machining process is used for machining
      a) very thick materials
      b) thin materials
      c) heavy sections
      d) is not used for machining.

   ii) Electro discharge machining uses which of the following dielectric fluids ?
      a) Water b) Aqueous salt solution
      c) Sodium hydroxide d) Kerosene.

   iii) Tungsten content in High Speed Steel cutting tool material is
      a) 18% b) 4%
      c) 1% d) 16%.

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

a) with low current density

b) with high current density

c) with slow rate of metal removal

d) with high rate of metal removal

e) at all metal removal rates.

v) Ceramic tools are made from

a) tungsten oxide b) silicon carbide

c) cobalt d) aluminium oxide.

vi) In which kind of the following operations on lathe, the spindle speed will be minimum ?

a) Knurling b) Taper turning

c) Thread cutting d) Parting off.

vii) Lathe bed is usually made of

a) stainless steel b) structural steel

c) cast iron d) mild steel.

viii) Boring is an operation performed for

a) finishing a drilled hole

b) producing a large hole

c) sizing a small hole

d) none of these.

ix) The cutting edges of a standard twist drill are called

a) flutes b) lips

c) wedges d) flanks.

x) Dovetail ways are used in

a) lathes b) planers

c) milling machines d) grinders.

GROUP – B

(Short Answer Type Questions)

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

2. Describe with neat sketch tool angles and cutting tool nomenclatures.
3. Derive an expression for economic tool life using Gilbert's model.
4. Explain with neat sketch the crank and slotted link mechanism of a shaper for executing quick return phenomenon.
5. Distinguish between the following : $2 \times 2½$
   i) Boring and Reaming
   ii) Up milling and down milling.

GROUP – C

(Long Answer Type Questions)

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

6. a) Derive an expression for shear strain developed in an orthogonal cutting tool and also determine the shear angle at which shear strain is minimum.
   b) Explain causes of failure of a cutting tool. Discuss on crater wear and flank wear of cutting tool.
   c) Show that, in orthogonal cutting with 0° rake angle the rate of shear stress τ_s to the specific cutting energy (U_s) is given by, $\frac{\tau_s}{U_s} = \frac{(1-\mu r)}{(1+r^2)}$. 6 + 4 + 5
7. a) 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.

b) During an orthogonal machining operation on mild steel the results obtained are : uncut thickness = 0·25 mm, chip thickness = 0·75 mm, width of cut = 2·5 mm, rake angle = 0°, cutting force = 950 N, thrust force = 475 N. Determine

i) the coefficient of friction between the tool and the chip

ii) the ultimate shear stress τ_s of the work material.

c) State generalized Taylor's tool life equation.
The lives of two tools, A and B governed by the equation $VT^{0.125} = 2.5$ and $VT^{0.25} = 7$ respectively in certain machining operations where v is the cutting speed in m/s and T is tool life in sec. Find out the speed V^* at which tools will have same life. Also calculate the corresponding tool life T^*. 7 + 4 + (1 + 3)

8. a) How speed variations can be obtained in an all geared headstock of a centre lathe ? Explain with figure.

b) Explain with schematic diagram the principle of thread cutting on a lathe.

c) Find the time required for taking a complete cut on a MS plate of 600×900 mm^2 by a shaper if the cutting speed is 9 m/min. The return time to cutting time ratio is 1 : 4 and the feed is 3 mm. The clearance at each end is 75 mm. 5 + 5 + 5

9. a) Describe twist drill nomenclature using sketches.

b) Calculate the change gears for indexing to give 153 divisions.

c) Distinguish between the following :
i) shaper and planner
ii) Gang milling and Straddle milling.

d) 1 mm pitch screw thread is to be cut on a centre lathe having 6 TPI lead screw. Calculate the gearing arrangement for the driver and driven, assuming the usual change gear availability. 5 + 4 + (2 × 2) + 2

==========