AUE-505

MACHINE TOOLS & MACHINING TECHNOLOGY

Time Allotted: 3 Hours | Full Marks: 70

The questions are of equal value.
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. Answer *all* questions. 10×1 = 10

(i) Both the cutting motion and feed motion are imparted to the cutting tool in

(A) lathe for turning (B) milling machine
(C) vertical boring machine (D) horizontal boring machine

(ii) The work piece is reciprocated for cutting motion in

(A) shaping machine
(B) planing machine
(C) slotting machine
(D) cylindrical grinding machine

(iii) Through cylindrical holes can be originated in solid bodies by machining in

(A) drilling machine (B) boring machine
(C) broaching machine (D) slotting machine

(iv) If 't' is the thickness of under formed chip in mm, 'Φ'is the side cutting edge angle of the single point cutting tool and 's' is the feed in mm/rev, then

(A) $t = s.\sin\Phi$ (B) $s = t.\sin\Phi$
(C) $t = s.\cos\Phi$ (D) $s = t.\cos\Phi$

(v) Back rake angle of a single point cutting tool

(A) by which the face of the tool is inclined sideways
(B) by which the face of the tool is inclined towards back
(C) by which the face of the tool is inclined with the flank
(D) none of these

(vi) Tool wear in carbide tool takes place due to

(A) diffusion (B) adhesion
(C) abrasion (D) all of these

(vii) Chip formation in turning a steel bar is basically a

(A) simple shearing process (B) tearing process
(C) plastic deformation (D) none of these

(viii) Criterion of tool life in HSS tool is

(A) flank wear
(B) crater wear
(C) fixed volume of chip removal
(D) increase in power consumption by 20%

(ix) Which of the following materials cannot be machined by EDM (Electro Discharge Machining)?

(A) Steel (B) Tungsten carbide
(C) Titanium (D) Glass

(x) Tool USM is generally made of

(A) Glass (B) Ceramic
(C) Carbides (D) Steel

GROUP B
(Short Answer Type Questions)

Answer any *three* questions. 3×5 = 15

2. (a) What is the effect of chip thickness ratio on shear plane angle?
   (b) Compute shear strain for orthogonal cutting?

3. Describe with neat sketch tool angles and cutting tool nomenclature.

4. (a) What are the desirable properties of a cutting tool material?
   (b) What are the conditions favorable for Built up Edge formation?

5. Describe Plasma Arc Machining (PAM).

6. What is explosive forming ?

GROUP C
(Long Answer Type Questions)

Answer any *three* questions. 3×15 = 45

7. (a) Explain the principle of ECM (Electro Chemical Machining) with a neat sketch 5+5+5
   (b) Give a short note on LBM (Laser Beam Machining).
   (c) Explain how material is removed in AWJM (Abrasive Water Jet Machining) process.

8. (a) Distinguish between- (2.5+2.5)+
   (i) shaper and planer 5+5
   (ii) boring and reaming
   (b) Calculate the time required to mill a slot of 100mm × 250mm in a C50 steel work piece with a slab mill cutter of 100mm diameter, 150mm width and having 8 teeth. The depth of cut is 2mm; the feed per tooth is 0.13mm and cutting speed is 20m/min.
   (c) Obtain indexing for 51 divisions.

9. (a) Define tool wear. What is Taylor's tool life equation? What is the basic mechanism of tool wear? (1+2
   (b) Explain with a neat sketch the principle types of wear.
   (c) A carbide cutting tool has a tool life exponent n=0.27. It gives a tool life of 60min while machining a mild steel work piece at a cutting speed of 120m/min. Compute the tool life if it is to be cut at a 20% higher cutting speed. Also what is the cutting speed if the tool life is to be doubled?

10.(a) In a orthogonal cutting of C35 steel with a HSS tool, the following conditions were obtained– width of the cut = 1.2mm, Rake angle = 15°, cutting ratio = 0.35, cutting force = 800N, thrust force = 800N. Calculate the shear angle and other force components. 5+
   (b) Define with a neat sketch the quick-return mechanism of shaper machine.
   (c) A shaper is operated at 120 cutting strokes per minute and is used to machine a work piece of 250mm length and 120mm width. Use a feed of 0.6mm per stroke and a depth of cut of 6mm. Calculate the total machining time. If the forward stroke is completed in 230 degree, estimate the cutting speed and Material Removal Rate (MRR) for machining a component. Taking approach distance of 25mm.

11.(a) Describe twist drill nomenclature using a neat sketch. 7+(2.5
   5
   (b) Differentiate between –
   (i) 3-jaw chuck and 4-jaw chuck
   (ii) multi-spindle drill and gang drill
   (c) What are the different methods of application of cutting fluid?