ENGINEERING & TECHNOLOGY EXAMINATIONS, DECEMBER – 2005

TECHNOLOGY OF MACHINING

SEMESTER – 5

Time : 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.

Note : i) Answer all the questions in Group-C which is compulsory

ii) Answer *five* full question taking any two from each of Groups-A and B.

a) What is turning ? Name the machine tool most widely used for turning. With a schematic diagram show how the job tool motion is provided. What is a copying lathe ? 1 + 1 + 3 + 1

b) What is a forming tool ? How is it used in turning ? Explain with the aid of a sketch. 1 + 2

c) Evaluate the machining parameters for the case of cylindrical turning of 25 mm dia brass bar at a spindle speed of 900 r.p.m. Depth of cut = 3 mm, longitudinal feed = 20 cm/min, length of work piece = 50 cm, Stock to be removed = 6 mm and side cutting edge angle of the tool = 30°.

Find the area of uncut chip and machining time. 2 + 1 + 2

Draw the Marchant's circle diagram and show all forces in chip formation and also list all the forces. 3

In an orthogonal machining operation, the following parameters were used :

Width of cut, w = 5 mm

Feed, = 0,2 mm/rev

Cutting speed = 200 m/min

Rake angle = 15°

The following were measured,

Thickness of chip, t_c = 0.32 mm

Cutting force components; F_c = 2500N ; F_t = 2000 N. Calculate shear stress and normal stress on shear plane and friction angle. 2 + 2 + 1

What are the different areas and sources of heat generation in metal cutting ? How is temperature measured in metal cutting zone ? 2 + 2

Explain revised Marchant's Circle diagram. 2

[Turn over

3. a) Sketch a single point turning tool showing important tool geometry in ORS. What is the effect of inclination angle on the chip flow ? 7

b) Sketch an HSS form milling cutter to show important tool geometry. Why is rake angle made zero in finish cut ? 7

4. a) Explain "Crater Wear" and "Flank wear". 5

b) What do you understand by tool life ? 2

c) What are the main-factors which influence the tool life ? 3

d) The following data were recorded while turning a mild steel rod on a lathe :

Cutting speed 30 m/min, feed rate = 0.25 mm/rev, depth of cut 2.0 mm, tool life 90 minutes. The following tool life equation is given for operation :

$$V f^{0.7} t^{0.3} = C$$

If the cutting speed is increased by 25%. What will be the effect on the tool life ? 4

Group B

5. a) What are the main advantages of using jigs and fixtures in mass production ? 4

b) What are the main differences between a jig and fixture ? 3

c) Explain the 3-2-1 principle of location in a jig or fixture with suitable sketch. 7

6. a) What is indexing head and what is its function ? 4

b) What are the different types of indexing head ? 4

c) On a milling machine, a gear with 83 teeth are to be cut. Find the crank movement for each tooth. Sketch the set-up. 6

7. a) What is Geneva Mechanism ? 4

b) What is the function of an Idler Gear in a lathe ? 2

c) Why is backlash eliminator used in Down milling operation. 4

d) What is the function of follower rest in a lathe ? 2

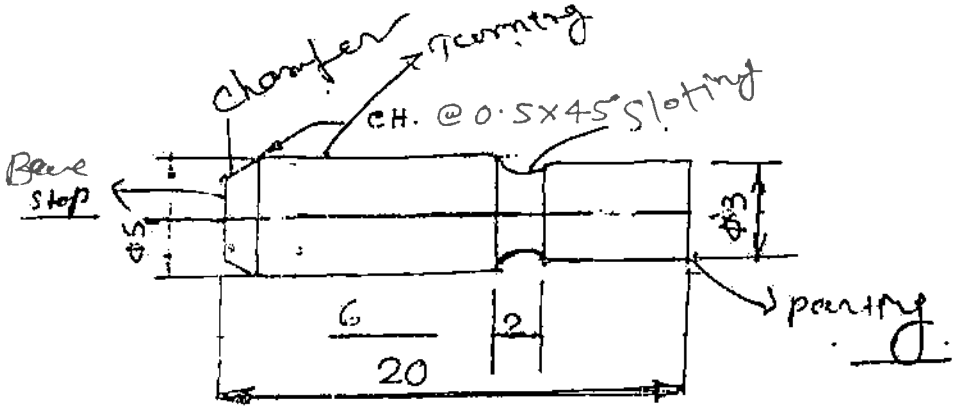
e) Name a machine tools using forming and generation process to machine the ... 2

a) What is bar feeding device ? In which machines is it used ? 3

b) What is the function of collet in turret lathe ? 2

c) How is the productivity increased in capstan and turret lathes ? 3

d) An M.S. Pin as shown in the fig. is to be produced in mass scale from 5 mm dia. bright rod. Select an automatic machine tool which will be suitable for this purpose and show the tool layout. 6



(All dimension are in mm)

Group - C

Make the correct choice (Answer all) : 14 × 1

i) Chip formation in turning a steel bar, is basically a

a) Simple shearing process

b) Tearing process

c) Plastic deformation process

ii) Surface roughness of a machined surface is more effected by nose radius of the tool than the feed rate

a) True

b) False

iii) Small accurate components are made on

a) Centre lathe

b) Capstan lathe

c) Multispindle automatic machines

d) Swiss type automatic screw machines

iv) If a mild steel bar of 100 mm diameter is turned at a cutting speed of 50 m/min, feed of 0.2 mm/rev and a depth of cut of 2 mm, the metal removal rate is

a) 20 mm^3/min

b) 20 cm^3/min

c) 40 mm^3/min

d) 40 cm^3/min.

v) At high cutting speed, the effectiveness of coolant is lost because of

a) High interface temperature

b) High interface pressure

c) Low contact time

d) Low viscosity of coolant.

vi) 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%.

vii) The usual ratio of forward and return stroke in a shaper is

a) 2 : 3 b) 1 : 2

c) 2 : 1 d) 3 : 2.

viii) In form turning circular form tool is set with an offset with job centre to provide

a) Rake angle

b) Clearance angle

c) Both rake and clearance angles

d) None of these.

ix) 'Broaching operation results into higher rate of production with higher accuracy than other machining operations'.

a) True

b) False

x) In a gear hobbing operation,

a) Only the hob rotates

b) Only the blank rotates

c) Both hob and blank rotate independently.

d) Both hob and blank rotate at a definite relation

xi) In the production of a cylindrical surface, generative motion is derived from

a) Rotation of the workpiece while the tool is imparted straight line directrix motion

b) Both the tool and workpiece are given rotational motion

c) Both the tool and workpiece are given translatory motion

xii) The bed of a lathe is made of

a) brass of 60-40 composition

b) high carbon steel, well heat treated

c) grey cast iron.

xiii) In a broaching mechine, the broach is given

a) Rotary motion

b) Translatory motion

c) Both rotary and translatory motions.

xiv) In centreless grinding, the workpriece being ground is made with

a) Centres at both the ends by combined drill and counter sink accurately

b) located between headstock and tailstock

c) The workpiece does not have any centre, but placed between grinding wheel and regulating wheel on workrest.