

**B.E. MECHANICAL ENGINEERING THIRD YEAR FIRST SEMESTER EXAM. 2019**

**MACHINING TECHNOLOGY AND METROLOGY**

Time: **3 hour**

Full Marks: **100**

Assume suitable data if necessary.

1. Answer any four: **5 X 4**

- a) Why are different spindle speeds necessary in a lathe? Why is GP series preferred over AP series for selecting spindle speeds of a machine tool?
- b) With the help of a neat sketch explain a cone-pulley head stock of a lathe.
- c) M 80 X 150 taper is to be turned on a 200 mm long mild steel job. Calculate the amount of tail stock set over. Discuss the taper turning method by offsetting the tail stock.
- d) Sketch and explain the use of follower rest in lathe work.
- e) A broaching machine is specified as VPU- 5- 54. Explain all the terms. Sketch a progressive cut broach.
- f) Sketch and indicate the main motions for the following processes:
  - i) Counter sinking a hole in drilling machine
  - ii) Reaming a hole in a drilling machine
  - iii) Tapping a hole in a drilling machine
- g) Discuss about gun drill.

2. Answer any two: **10 + 10**

- a) A reamer with 40 mm diameter and lead= 800 mm (LH) is to be milled in a milling machine having the table feed screw with lead= 5 mm. The depth of the helix is 8 mm. Calculate the table swiveling angle and the change gears. Available change gears are: 24(2), 28, 32, 36, 40, 44, 48, 56, 64, 72, 86, 100.

Or

Explain how 80 divisions can be indexed.

A steel job 115 X 250 mm is to be milled by a cemented carbide slab milling cutter of diameter = 150 mm and number of teeth =16. The depth of cut is 6 mm with cutting speed of 60 m/min and feed/tooth = 0.18 mm. Calculate the machining time for one pass.

- b) A grinding wheel is designated as A-40-L-8-V. Explain all the terms.  
A gib 750 mm long is to be ground. Grinding allowances is 0.6 mm, number of cuts = 4, speed of the table = 2 m/min, wheel diameter 150 mm. No feed

[ Turn over

adjustment during return stroke. A vertical spindle grinding machine is to be used. Calculate the machining time.

Or

Discuss about honing and lapping operations. Give necessary sketches.

- c) How is a shaping machine specified? Discuss about the slotted arm quick return mechanism and Pawl & Ratchet mechanism of a shaping machine.
3. a) Discuss about hss and carbide as tool material. 5
- b) A single point turning tool is designated as:  $9^{\circ}-9^{\circ}-7^{\circ}-7^{\circ}-30^{\circ}-25^{\circ}-0$  mm (ASA). Sketch the views of the tool to show all the relevant feature of it. 6
- c) 'Strain in work piece causes machining errors'-explain. 4
- d) A stepped as shown in Figure 1 is to be turned.

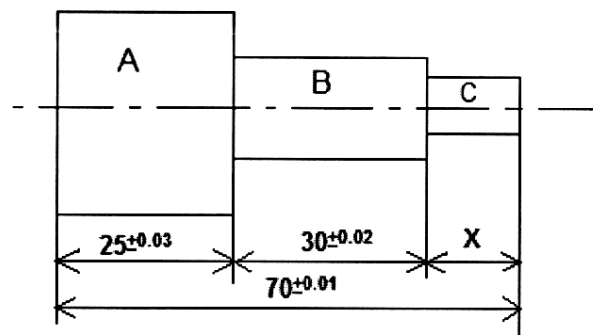


Figure 1

The concentricity error of step B with A is 0.001mm and the same for step C with A is 0.003mm. Indicate them on the working drawing. Also determine the dimension X. 5

4. a) Discuss the working principle of EBM and CHM.

Or

An alloy contains Ni (72.5%), Cr (19.5%), Fe (5.0%), Ti (0.4%), Si (1.0%), Mn (1.0%) and Cu (0.6%). The related information about the metals is given below:

<u>Metal</u>	<u>Gram atomic weight</u>	<u>Valency of dissolution</u>	<u>Density (g/cc)</u>
Ni	58.71	2	8.90
Cr	51.99	2	7.19
Fe	55.85	2	7.86
Ti	47.90	3	4.51
Si	28.09	4	2.33
Mn	54.94	2	7.43
Cu	63.57	1	8.96

Calculate the mrr in cc/min when a current of 1000 A is passed.

10

- b) Compare among form error, surface waviness and surface roughness.
  - c) Explain  $R_a$  and  $R_z$  values of surface roughness. **6 + 4**
- 5.
- a) With the help of a neat sketch, explain how the roller diameter used in metrology laboratory can be measured by an optical flat.
  - b) A hole and a shaft have a basic size of 30 mm, and are to have a clearance fit with maximum clearance of 0.03 mm and a minimum clearance of 0.02 mm. The hole tolerance is to be 1.4 times the shaft tolerance. Determine the sizes of hole and shaft using a shaft basis system.
  - c) Discuss the working principle of Solex Pneumatic Comparator.
  - d) What is best size wire in thread measurement?
  - e) State the effects of nose radius on the surface finish. **4 + 5 + 7 + 2 + 2**