

**BACHELOR OF ENGINEERING (MECHANICAL ENGINEERING)
THIRD YEAR FIRST SEMESTER (OLD) EXAMINATION - 2019**

MACHINING TECHNOLOGY AND METROLOGY

Time: 3 hour

Full Marks: 100

Answer any *five* questions

Assume suitable data if necessary.

1. a) Define cutting speed, feed and depth of cut in metal cutting. State the factors on which they depend.
b) Neatly sketch the apron mechanism of a lathe and label it.
c) Sketch and explain the use of cone pulley headstock of a lathe. Write its advantages and disadvantages. 10 + 5 + 5

2. a) One ms bar of diameter 40 mm is to be turned down to 30 mm with a hss turning tool over a length of 100 mm. The cutting speed is 28 m/min and feed is 0.2 mm/rev. Calculate the machining time.
b) Discuss how a taper is expressed.
c) M 80 X 200 taper is to be turned. Calculate the tailstock set over. Discuss the taper turning by offsetting the tailstock centre.
d) Sketch and explain the follower rest. 5 + 5 + 5 + 5

3. a) Write the differences between
 - i) Shaping and turning operations.
 - ii) Plunge cut grinding and traverse cut grinding.
 - iii) Push cut shaper and draw cut shaper.b) A 500 X 400 mm ms plate is to be machined using hss shaping tool. The quick return ratio of the machine is 3:2. The pawl carries 3 teeth of a 20 teeth ratchet wheel mounted on 4 mm pitch table feed screw. Assume cutting speed of 16 m/min. Calculate the machining time for removal of 8 mm stock
c) Explain the multiple spindle drilling machine. 9 + 7 + 4

4. a) Discuss about through feed centreless grinding operation.
b) A grinding wheel is designated as A-36-L-7-V. Explain all the terms of it.
c) 80 divisions are to be indexed. Explain the indexing method with suitable sketch 6 + 4 + 10

5. a) Write the differences between up cut milling and down cut milling operations.
b) Neatly sketch a twist drill to show all relevant features of it.

[Turn over

- c) 16 holes of diameter 10 mm are to be drilled on 20 ms plates having thickness of 8 mm using hss twist drill. Assuming suitable cutting speed and feed, calculate the machining time. What is the total MRR for drilling these holes? 6 + 6 + 8
6. a) Explain the causes of tool material failure. Also write the essential properties of an ideal tool material.
- b) Discuss about coated carbide as cutting tool material.
- c) Write the tool signature of a single point turning tool is ASA and show the views of the tool. 9 + 4 + 7
7. a) Discuss about the different types of fits and explain them in reference to hole basis system. Give necessary sketches.
- b) Determine the sizes of the hole and shaft for the assembly 30 H9/f7. The diameter steps are 3-6-10-18-30-50-80-..... mm. The standard tolerance unit, i (in μm) $=0.45D^{1/3}+0.001D$ where D is in mm. The fundamental deviation for 'f' shaft $= -5.5D^{0.41}$, $IT7=16i$, $IT9=40i$. Determine the type of fit.
- c) Discuss about form error, surface waviness and surface roughness 5 + 9 + 6
8. Write short notes on any four: 4 x 5
- a) Gear box with cluster gear.
 - b) HSS as tool material.
 - c) Slotted arm quick return mechanism.
 - d) Gun drill.
 - e) Knee type milling machine.
 - f) Creep feed grinding.
 - g) Talysurf.