Manufacturing Process (ME1102)

Assignment Sheet
(MACHINING)

1. Explain the geometry of a single point cutting tool with neat sketch. Also discuss about the role of the provided rake angle and clearance angle.
2. Explain the term 'single point and multiple point cutting tool' with examples.
3. Classify the various machine tools based on motions used for generating the surfaces.
4. How do you select a machine tool for a given application? Give your answer with an application.
5. Write the names of different parts of a centre lathe. Also state their functions.
6. Briefly discuss about different lathe operations with neat sketch.
7. Briefly discuss about different milling operations. Also make a list of different milling cutters used in different milling operations.

Numerical problems:

1. In a lathe turning operation, diameter of a 50 mm long MS shaft to be reduced from 32 mm to 30 mm in 2 minutes. If the optimum cutting speed is 20 meter/ minute, determine the values of spindle RPM, depth of cut and feed rate. Also draw a schematic diagram to explain the turning process.
2. A lathe operation is involved in turning $\phi 32 \times 40$ mm raw material into $\phi 30 \times 40$ mm semi-finished product in 5 minutes at recommended cutting speed 20 m/min. So, estimate the spindle RPM, depth of cut and feed rate (mm/rev).
3. A turning operation is performed on a cylindrical work part whose diameter = 120 mm and length = 450 mm. Cutting speed = 2.0m/s, feed = 0.25 mm/rev, and depth of cut = 2.2 mm. Determine (i) cutting time and (ii) material removal rate.
4. A 600 mm X 30 mm flat surface of a plate is to be finish machined on a shaper. The job has been fixed with the 600 mm side along the tool travel direction. If the tool over travel at each end of the plate is 20 mm, average cutting speed is 8 m/min, feed rate is 0.3 mm/stroke and the ratio of return time to cutting time of the tool is 1:2. Calculate the time required to complete the job.
5. A peripheral milling operation is performed on a rectangular workpiece that is 320 mm long by 60 mm wide by 56 mm thick. The 65-mm-diameter milling cutter has 4 teeth, is 80 mm long, and overhangs the work on either side by 10 mm. The operation reduces the thickness of the piece to 50 mm. Cutting speed = 0.50 m/s and chip load = 0.24 mm/tooth. Determine (a) machining time and (b) metal removal rate once the cutter reaches full depth.
6. In a slab-milling operation, the length of the workpiece is 150 mm, its width is 50 mm, and a layer 10 mm in thickness is to be removed from its upper surface. The diameter of the cutter is 40 mm and, it has 10 teeth. The feed rate selected is 2 mm/sec and cutter speed is 2.5 revolution/sec. Estimate (i) The feed per teeth and (ii) The machining time for the operation
7. A face milling operation is performed on the top surface of a steel block that is 12.0 in long by 2.0 in wide by 2.5 in thick. The milling cutter follows a path that is centered over the width of the block. It has five teeth and a 3.0 in diameter. Cutting speed = 250 ft/min, feed = 0.006 in/tooth, and depth of cut = 0.150 in. Determine (a) machining time and (b) maximum metal removal rate during the cut.
8. A drilling operation is performed to create a through hole on a steel plate that is 15 mm thick. Cutting speed = 0.5 m/s, and feed = 0.22 mm/rev. The 20-mm diameter twist drill has a point angle of 118°. Determine (a) the machining time and (b) metal removal rate once the drill reaches full diameter.