

Material Removal Processes (MCL 136)
Minor I

F.M. 30

Time: 1 hr(Exam time) +30 mins (for uploading the answersheets in Moodle)

All answers must be brief and to the point. Assume any relevant data wherever required. All parts of a question must be answered together.

1. Sketch the following machining processes and show the cutting velocity and the feed motions. Also indicate how the generatrix and directrix for each of the machining processes is obtained and whether the primary motions or any auxiliary motions were involved?
 - a. Slot milling by end mill cutter
 - b. Internal thread turning in a centre lathe. 2+2= 4

2. With neat sketches show how the rake and clearance angles of a single point turning tool is altered when the tool is not centered properly with respect to the workpiece.(consider both the cases when the tool is above the centre and below the centre). 3

3. A single point cutting tool has an approach angle of 55° , a normal rake angle of 12° and the principal cutting edge lies in a plane parallel to the base of the tool. Find the side and back rake angles for this condition. 3

4. What are the advantages and limitations of each of these following chip forms:
 - a. Discontinuous
 - b. Continuous
 - c. Segmented 3

5. Distinguish between a stable built up edge and an unstable built up edge formation and explain with proper logic which one will be more advantageous during machining operation. 2

6. With neat sketches show the auxiliary normal clearance angle of a single point cutting tool and mention the significance of the angle. 3

7. Why overbreaking of chips is not desired during the machining process and how can one avoid overbreaking of the chips? What are the detrimental effects of controlled contact cutting effect? 3

8. What are the advantages and limitations of imparting ultrasonic vibration onto a single point cutting tool during turning operation? 2

9. Explain why Merchant's Circle Diagram is valid only for orthogonal machining process. In a pure orthogonal turning process by a zero rake angle tool, the following observations have been made: The tangential force has been found to be 800 N and the axial thrust force is 300 N. The approach angle of the tool is 0° . The depth of cut and the feed used during the turning process are 4 mm and 0.2 mm/rev respectively. Find out the dynamic shear strength, τ_s (in MPa) of the work material.

1+4=5

10. Why is a chisel edge present in a twist drill? How can you minimize the total axial thrust generated by a twist drilling?

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