

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
M.Tech. Winter 2017 - 18 Examination

Semester: 1
Subject Code: 03208101
Subject Name: Theory of Machining Science

Date: 26/12/2017
Time: 2:00 pm to 4:30 pm
Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

- Q.1** A) Differentiate between orthogonal and oblique cutting. Discuss with neat sketch mechanism of chip formation. (05)
- B) Define machinability? On basis of which factors you can compare machinability of two different materials on a similar condition (05)
- C) Give the tool signature of single point tool as per ASA system and also explain single point cutting tool geometry with significance of each angle. (05)
- Q.2 Answer the following questions.** (Attempt any three) (Each five mark) (15)
- A) Show the regions of heat generation with neat sketch and explain causes behind the heat generation.
- B) Explain the marking system of conventional grinding wheel.
- C) Draw neat sketch of chip formation in metal cutting and derive following relation for the shear angle (ϕ) and tool rake angle.

$$\tan \phi = \frac{r \cos \alpha}{(1 - r \sin \alpha)}$$

- D) Derive the equation to find out temperature of chip.
- Q.3** A) List out limitations of merchant circle diagram. Draw neat sketch of merchant's circle diagram and derive the following relation for tangential cutting force (F_t) and shear force (F_s). (07)

$$F_t = F_s \left[\frac{\cos(\beta - \alpha)}{\cos(\phi + \beta - \alpha)} \right]$$

Where,

ϕ = shear plane angle

β = angle of friction

α = tool rake angle.

- B) Define tool life & derive equation for economics of machining based on maximization of production rate. (08)

OR

- B) The following data for Orthogonal Machining operation is as follows: (08)
- | | |
|---|-------------------------|
| Rake angle | = 15 degree |
| Chip thickness ratio | = 0.383 |
| Uncut chip thickness | = 0.5mm |
| Width of cut | = 3 mm |
| Yield Stress of Shear | = 280 N/mm ² |
| Average co-efficient of Friction on the tool face | = 0.7 |
- Determine the normal and tangential on the tool face.

- Q.4** A) Draw a neat sketch of ECM & derive expression for material removal rate. (07)

OR

- A) What is the general principle to measure cutting forces? Explain the measurement of cutting forces by Piezoelectric transducer. (07)
- B) Why non-traditional machining process needed in today's era? Explain principle of AJM. (08)