DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103
Mid Semester Examination – October - 2017

Branch: M.Tech (Manufacturing Engineering)
Sem.:- I

Subject with Subject Code: - Theory of Machining (Code: MMF101)
Marks: 20

Date:- 09/10/2017 **Time:- 1 Hr.**

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Q.No.1 Attempt any one of the following (1X8=08)

a.) Derive equation for 'Determination of shear angle' based on experimental method.

Answer: Step 1- draw neat sketch of orthogonal cutting model to show relationship between various angles such as shear angle and rake angle.

Step 2 – determine the chip thickness ratio

Step 3 – Derive equation for shear angle in terms of chip thickness ratio and rake angle.

b.) In an orthogonal cutting test following conditions were noted:
Width of chip=2.5mm, un-deformed chip thickness=0.25mm, chip thickness=1.0mm, working normal rake= -5 deg, cutting force= 900N, Thrust force= 900N. Calculate shear angle, mean shear strength of work material.

Answer: Step 1 – Determine $r=\frac{ac}{ao}$ **and put in** $\tan\varnothing=(\frac{rcos\alpha}{1-rsin\alpha})$

Step 2 – Determine shear stress using shear force and area of shear plane.

Q. No. 2 Attempt any three of the following: (3X4=12)

a.) Explain why different rake angles are used for machining with different cutting tools materials. Give several examples to justify your answer.

Answer: The rake angle has two major effects during the metal cutting process. One major effect of the rake angle is its influence on tool strength. An insert with a negative rake will withstand far more loading than an insert with a positive rake. The cutting force and heat are absorbed by a greater mass of the tool material, and the compressive strength of carbide is about two and one half times greater than its

transverse rupture strength. The positive rake angle will produce better cutting action as compared to negative rake. Thus, hardness and toughness of the tool materials as well as cutting process needs to design tools with different rake angles.

b.) Explain why maximum temperature in cutting is located at about the middle of the chip tool interface?

Answer: since there are two principal sources of heat shear plane and the tool-chip interface, the maximum heat is approximately at about the middle of the interface of chip and tool.

c.) Give general characteristics of machining processed used for producing round shapes.

Turning: needs skilled labor, low production rate, automated turning need low skilled labour.

Boring: To produce internal surfaces or profiles, stiffness of bar is essential to avoid chatter

Drilling: generation of round holes with various diameter and depth, requires boring and reaming for improved surface finish and accuracy, high production rate

d.)What do you understand by ‘specific cutting energy’ in metal cutting? Explain.

Answer: the rate of energy consumption and material removal are proportional to cutting speed. The parameter, which gives indication of the efficiency of the process, however, independent of cutting speed, energy consumed per unit volume of the material removed is called as specific cutting energy.

The specific cutting energy can vary for a given work and is also influenced by speed, feed, tool rake etc.

$$Ps = \frac{Pm}{Zw} = \frac{Fc}{Ac}$$

Where **Pm** is the energy consumption during machining, Zw material removal rate, Ac is the cross-sectional area of the uncut chip, Fc is the cutting force.