VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA

DEPARTMENT OF PRODUCTION ENGINEERING

MID SEM EXAM, SEPT 2015

Subject: Theory of Metal Cutting **(TMC)** Full Marks: 20

Semester: B.Tech, 5th Sem Time: 2 hours

Answer all questions

Q.1. Answer the following question: **[1×5]**

(a) What are the basic properties of cutting tool material ?

(b) Why side clearance angle is provided on a cutting tool ?

(c) What are advantages of positive rake angle of single point cutting tool ?

(d) Differentiate between orthogonal and oblique cutting ?

(e) Name the conditions that favor built up zone formation. What are the advantage and disadvantages of BUE formation ?

Q.2. (a) During an orthogonal cutting experiment using a tool with 10° rack angle, 75° principal cutting edge angle and 7° end cutting angle, it was observed that

Cutting force=1500N. , Feed force=1000N. , Cutting Velocity=120m/min., Feed=0.3mm/rev. and Chip thickness=0.6mm.

Calculate **[2.5×2]**

(i) Magnitude of forces on tool face, (ii) Magnitude forces on Shear plane, (iii) Resultant cutting force

(b) Use the above date and calculate the following

(i) Cutting Power, (ii) Specific Cutting energy, (iii) Dynamic yield Shear strength of the work material

(iv) Chip flow velocity and shear velocity, (v) Shear Strain in chip, (vi) Strain rate, (vii) Maximum pick to valley height

Q.3 Answer any one

(a) A single point cutting tool is designated as 0°-8°-5°-8°-15°-90°-0.8mm in ORS. Determine the designation of the same cutting tool in ASA.

(b) Write short notes on any two **[5×1]**

ii. Tool materials
iii. Merchant's forces circle
iii. MRR of Drilling

[2.5×2]

Q.4 (a) Answer any two

(i) In straight turning of low carbon steel bar, the uncut chip thickness is 0.2mm. The longitudinal feed is 0.2 mm/rev. The orthogonal rake is 12°. Calculate the principal cutting edge angle.

(ii) The back rake of a single point turning tool is 10°. The orthogonal rake and inclination angle of the same tool is 7° and 10° respectively. Calculate the principal cutting edge angle.

(iii) The principal cutting edge angle of a single point cutting tool is 90°. The same tool with an orthogonal rake angle of 0° is employed for turning with a longitudinal feed of 0.3 mm/rev. The chip thickness is 0.60 mm/rev. Determine the shear angle.

(b) Answer any two

(i) Turning of a 200mm diameter steel bar is undertaken at a cutting velocity of 120mm/min. The depth of cut and feed of 4mm and 0.1mm/rev respectively. Determine material removal rate in mm³/s.

(ii) With suitable example explain tool Signature.

(iii) What are the significances of rake angle and clearance angle of drill?