[Total No. of Questions - 9] [Total No. of Printed Pages - 3]
(2125)

15377

M. Tech 1st Semester Examination

Metal Cutting (NS)

PE-102

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt any one question from each section A to D. Attempt all questions of section E.

SECTION - A

1. Explain the system of tool nomenclature in metal cutting. With the help of neat sketches, explain briefly the tool elements and tool angles in case of single point tool. (20)

2. Explain the mechanism of chip formation in ductile & brittle material. State the factors on which the value of shear angle depends. (20)

SECTION - B

3. Explain the concept of chip thickness ratio & shear angle. Derive an expression for shear velocity and shear plane angle. (20)

4. What is the difference between orthogonal & oblique cutting? Also discuss the concept of shear strain and normal strain distribution in metal cutting. (20)

[P.T.O.]

SECTION - C

5. Explain the concept of free body abrasion. Also discuss the mechanism of grinding and effect of grit chip thickness in grinding operation. (20)

6. What is true stress and also discuss the effect of cutting variable on chip reduction coefficient. Explain how optimum tool life is achieved. (20)

SECTION - D

7. Explain the various zones on formation of heat in the work piece. Explain techniques to reduce the generation of heat. What are the merits & demerits of heat generation in tool & workpiece while cutting? (20)

8. Analytically estimate the average shear zone Temperature, θ for plain turning of a mild steel rod of diameter 100 mm by a carbide tool of geometry -6°, -6°, 6°, 6°, 15°, 75°, 1.2 (mm) NRS at speed 400 rpm, feed 0.12 mm/rev and depth of cut 3.0 mm under dry condition when the followings were noted: Main cutting force component, P=1200 N, Frictional force at the rake surface, F = 500 N, Chip thickness a= 0.6 mm. Assume: 80% of mechanical energy gets converted into heat, 90% of the heat generated at the shear zone goes into the chips, Mechanical equivalent of heat, J = 4.2 J/Cal, Volume specific heat of mild steel, ρ_v=3554KJ/m^3°C. Ambient temperature, θ_a = 25°. (20)

SECTION - E

9. Explain the following in brief:

   (i) True shear angle.

   (ii) Effective rake angle.

(iii) Effect of feed on chip reduction coefficient.

(iv) Effect of cutting velocity on chip reduction coefficient.

(v) Effect of depth of cut on chip reduction coefficient.

(vi) Hot machining.

(vii) Cutting variables on cutting forces.

(viii) Tool material analysis of plastic failure.

(ix) Analysis of tool failure by brittle fracture.

(x) Criteria for tool failure. (2×10=20)