

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH.] DEC.-2019

Paper Code: ETAT303

Subject: Metal Cutting & Tool Design

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q. No. 1 which is compulsory. Assume missing data, if any.

- Q1 Answer the following: (5x5=25)
- (a) What do you understand by Orthogonal and Oblique cutting? How do they differ from each other?
 - (b) What are the different sources and areas of heat generation during metal cutting? Explain.
 - (c) What are the main factors which influence life?
 - (d) What do you understand by "machinability"? Discuss the parameters that influence machinability.
 - (e) Write the differences between Jigs and fixtures.
- Q2
- (a) Derive the expression to show the relationship between chip thickness ratio, shear angle and top rake angle. (6.5)
 - (b) Derive expressions useful for determining the work done per unit volume of metal removed of these during metal cutting. (6)
- Q3
- (a) How many types of chips are formed in metal cutting? What factors are responsible for these different types of chips? What do you mean by built up edge? (6.5)
 - (b) What are common methods of chip breaking and what are the means used for the same. (6)
- Q4
- (a) Explain Earnst- Merchant theory of metal cutting. State the assumptions upon which this is based. What are the limitations of this theory? (6.5)
 - (b) What are indications of inefficient performance of cutting tool? (6)
- Q5
- In orthogonal turning of a 50 mm dia. Mild steel bar on a lathe, the following data was obtained: Rake angle = 15°, Cutting speed = 100 m/min., feed = 0.2 mm/rev., cutting force = 180 kg, feed force = 60 kg. Calculate the shear plane angle (ϕ) coefficient of friction (μ), cutting power, the chip flow velocity (V_f), and shear force, if chip thickness = 0.3 mm. (12.5)
- Q6
- (a) Explain the term Optimum cutting speed. How are different cost components influenced by variation in cutting speed? (6.5)
 - (b) What are the different qualities of a good cutting fluid? (6)
- Q7
- (a) What do you understand by 'Grain', 'Grit', 'Structure' and 'Grade' of a grinding wheel? Explain. (6.5)
 - (b) Explain 'Truing' and 'Dressing' of grinding wheels. (6)
- Q8
- (a) What is a 'Twist drill'? Make a neat sketch of a twist drill and show its different parts. (6.5)
 - (b) Describe 'Push' and 'Pull' broaching with the neat sketch. (6)
- Q9
- (a) What is principle of six location? Explain. (6.5)
 - (b) Why a clamping device is necessary for jigs and fixtures and what are its main functions? (6)
