

(3 Hours)

Total Marks: 80

N.B: (1) Question No.1 is compulsory.

(2) Attempt any three questions out of the remaining ^{four} five questions.

(3) Assume suitable data, if necessary.

(4) Figures to the right indicate full marks.

- Q1** a Derive the relationship between MRS rake angles and ORS rake angles by method of slope. (08)
- b Explain how the tool shank is designed for rigidity and strength. (08)
- c Explain the chip formation due to plastic deformation. (04)
- Q2** a Derive an expression for Taylor's exponent by taper turning test. (08)
- b Following data relates to the machining operation of a carbon steel: Cutting speed = 180 m/min, Depth of cut = 1.4 mm, Width of cut = 2 mm, Feed = 0.2 mm/rev, Chip thickness = 0.4 mm, Cutting force in cutting velocity direction = 1200N, Feed force = 800 N, Rake angle 10 degrees (12)
- Find (i) Shear angle and Shear force, (ii) Friction force and friction angle (iii) Resultant force, (iv) Shear Velocity and Chip Velocity, (v) Average Shear Stress and Normal Stress on shear plane, (vi) Specific Cutting Energy and Power required for cutting in KW.
- Q3** a Derive an expression for total minimum cost of operation at optimum cutting speed with optimum tool life (10)
- b Explain with your own example how the profile depth in circular form tool can be calculated analytically. (10)
- Q4** a Explain the effect of speed, feed, depth of cut and tool angles on tool life. (10)
- b Explain the step by step procedure for round broach design assuming suitable data. (10)
- Q5** Write short notes on the following (any four) (20)
- a Tool force dynamometers
- b Design of reamer.
- c Cutting fluids.
- d Orthogonal and oblique cutting.
- e Orthogonal Rake System (ORS) of tool nomenclature.
- F Tangential hobbing.