

Duration: 3hrs

Max Marks: 80

- N.B.** (1) All questions carry equal marks.
 (2) Question No. 1 is Compulsory.
 (3) Attempt any three questions from remaining five questions.
 (4) Figures to the right indicate full marks.
 (5) Draw neat sketches wherever necessary.

- Que. 1 Attempt any **four** of the following: (20)
- How the milling cutters are classified?
 - Name the different types of chips formed in metal cutting. Describe each type with the help of neat sketches.
 - Give different types of cutting fluids? Explain any two in details?
 - Explain milling dynamometer with neat sketch.
 - Explain Built Up Edge (BUE) formation and its influence on surface finish.
 - Explain orthogonal rake system (ORS) in detail.
- Que. 2
- Discuss different cutting tool materials with their properties and application. (10)
 - The following observation were made during an orthogonal cutting operation: Depth of cut = 0.3 mm; Chip thickness = 0.6 mm; Rake angle = 20° ; Cutting velocity = 102 m/min; Cutting force = 300 N; Feed force = 120 N.
Determine: (i) Shear angle. (ii) Shear strain. (iii) Velocity of chip along the tool face. (iv) Work done in shear (10)
- Que. 3
- Calculate the length of broach for roughing and finishing operation for machining a slot 10 mm in depth and 20 mm in width for 400 mm long steel piece having specific cutting energy of 2000 N/mm^2 . Cutting speed is 5 m/min and chip space number 8. Taking roughing feed as 0.08 mm/tooth and finishing feed as 0.02 mm/tooth. Assume blunt broach factor (1.25 to 1.40) (10)
 - Define Tool Life and explain factors affecting tool life. (10)
- Que. 4
- The tool life for a high speed steel (H. S. S.) tool is expressed by the relation $V T^{0.143} = C_1$ and for Tungsten carbide (WC) is expressed as $V T^{0.2} = C_2$. If at a speed of 24 metre / min. the tool life is 128 minutes compare the life of the tools at a speed 30 metre / min. (10)
 - What are the sources of heat generation in metal cutting and also explain the distribution of temperature during metal cutting process. (10)
- Que. 5
- Discuss the following design features of a reamer : (10)
Reaming allowance (ii) Diameter of reamer (iii) Length of body (iv) Back taper or relief (v) Rake and Clearance angle (vi) Number of teeth.
 - i) Explain tool work thermocouple method with sketch for cutting temperature measurement. (10)
ii) Draw and explain design of simple step type chip Breaker.
- Que. 6
- Explain the various elements of a single – point cutting tool with the help of a neat diagram. Also explain machine reference system (MRS). (10)
 - Clearly stating the assumption derive the relationship (10)
 $2\theta + \beta - \alpha = \frac{\pi}{2}$ in Merchant's original theory.
Where; θ = Shear angle, α = Rake angle, β = Friction angle.
