16/12/2024 MECHANICAL SEM-VI C SCHEME TE (DLOC) QP CODE: 10068927

**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)
A. How the milling cutters are classified?
B. Name the different types of chips formed in metal cutting. Describe each type with the help of neat sketches.
C. Give different types of cutting fluids? Explain any two in details?
D. Explain milling dynamometer with neat sketch.
E. Explain Built Up Edge (BUE) formation and its influence on surface finish.
F. Explain orthogonal rake system (ORS) in detail.

Que. 2 A. Discuss different cutting tool materials with their properties and application. (10)
B. The following observation were made during an orthogonal cutting operation: Depth of cut = 0.3 mm; Chip thickness = 0.6 mm: Rake angle = $20^0$; Cutting velocity = 102 m/min; Cutting force = 300 N; Feed force = 120 N. (10)
Determine: (i) Shear angle. (ii) Shear strain. (iii) Velocity of chip along the tool face. (iv) Work done in shear

Que. 3 A. 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)
B. Define Tool Life and explain factors affecting tool life. (10)

Que. 4 A. 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)
B. What are the sources of heat generation in metal cutting and also explain the distribution of temperature during metal cutting process. (10)

Que. 5 A. 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.
B 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 A. Explain the various elements of a single – point cutting tool with the help of a neat diagram. Also explain machine reference system (MRS). (10)
B. Clearly stating the assumption derive the relationship $2\emptyset + \beta - \alpha = \frac{\pi}{2}$ in Merchant's original theory. (10)
Where; $\emptyset$ = Shear angle, $\alpha$ = Rake angle, $\beta$ = Friction angle.

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