T.E. (Mechanical) (Sem-V) (CBS) Date - 27/11/1

(3 Hours) [Total Marks : 80]

N.B. **(1)** Question no. **1** is **compulsory.**
(2) Attempt any **three** questions out of remaining **five** questions.
(3) Illustrate your answer with **necessary** sketch wherever **necessary**.
(4) Figures to the **right** indicate full **marks**.
(5) Assume suitable data wherever **necessary**.

1. **Attempt any FOUR of the following :** **(20)**

(a) Write in brief about Lee and Shaffer's theory.

(b) Explain about the action of coolants.

(c) Explain crater wear and flank wear.

(d) Write in brief about micro hardness.

(e) Explain about the Normal Rake System (NRS).

2. **(a)** In an orthogonal turning operation on a lathe, the following observations were obtained: Cutting force = 120 N, Feed rate = 0.2 mm/rev, Feed force = 30 N, Cutting thickness = 0.3 mm, Back rake angle = 15°, Cutting speed = 100 m/min, Workpiece diameter = 120 mm, Depth of cut = 0.4 mm. Calculate: (i) Chip thickness ratio (ii) Shear angle (iii) Friction angle (iv) Coefficient of friction (v) Shear stress. **(10)**

(b) Explain about the sources of heat in metal cutting. **(6)**

(c) Write in brief about the measurement of cutting temperature. **(4)**

3. **(a)** A carbide tipped tool of designation 0-10-5-5-8-90-1 mm (ORS) is used to turn a steel workpiece of 50 mm diameter with cutting speed of 240 m/min and feed of 0.25 mm/rev. If Cutting force = 180 N, Feed force = 100 N, Chip thickness = 0.32 mm. Calculate: (i) Shear angle, (ii) Shear force, (iii) Normal force acting on shear plane, (iv) Coefficient of friction, (v) Chip flow velocity. **(10)**

(b) Explain Built Up Edge (BUE) formation and its influence on surface finish. **(6)**

(c) Write short note on: Polycrystalline diamond (PCD). **(4)**

4. **(a)** Explain Taylor's tool life equation. **(10)**

(b) Write short note on: Chip breakers. **(6)**

(c) Explain the constructional features of tipped tools. **(4)**

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5. **(a)** In a certain tool test, a single point cutting tool had a life of 10 minutes when operating at 240m/min. At what speed should the tool have to be operated in order to have a tool life of 3 hours? Taken n = 0.2 **(10)**

(b) Explain about the tangential form tools. **(6)**

(c) Calculate the total effective length and the number of teeth of a broach to be used for cutting a keyway 5 mm wide, 2.5 mm deep in a boss 45 mm long. Assume number of finishing teeth = 6 and rise per tooth = 0.0875 mm. **(4)**

6. **(a)** Find the total effective length of a broach to be used for cutting a square keyway of 5 mm side in a boss of 60 mm length. Assume number of finishing teeth = 5 and rise per tooth = 0.075 mm. Also find number of teeth of a broach and force required to pull the broach if K = 4000 N. **(10)**

(b) Explain the constructional details of flat form tool. **(6)**

(c) Write short note on: Drilling dynamometer **(4)**

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