

(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)**
- Write in brief about mechanism of orthogonal metal cutting.
 - Write short note on cutting tool materials
 - Write short note on cutting fluids
 - Explain crater wear and flank wear.
 - Draw merchant circle diagram and forces with usual notations and assumptions of merchant's theory
2. (a) A pipe 38mm in diameter is being turned on a lathe with a tool having rake angle of 33° and a feed of 0.15mm/rev. The length of chip over one revolution of workpiece is 72mm. The cutting speed is 12.5m/min, the tangential force is 410N and the feed force is 170 N. Calculate (a) coefficient of friction on the rake force; (b) thickness of chip; (c) angle of shear; (d) velocity of shear (e) velocity of chip along the tool face **(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) During machining of low carbon steel with HSS cutting tool, the following observations were made: **(10)**
- | | | |
|-----------------------|----|----|
| cutting speed, m/mins | 40 | 50 |
| Tool life, minutes | 40 | 10 |
- Derive the v-t relationship
- (b) Write short note on metal cutting chips **(6)**
- (c) Write short note on: Cubic Boron Nitride (CBN) **(4)**
4. (a) Derive an expression for optimum cutting speed at minimum cost criteria by using usual notations **(10)**
- (b) Design procedure for single point cutting tool shanks **(6)**
- (c) Write tool signature for single point cutting tool (ASA) **(4)**

5. (a) Derive merchant's modified theory with usual notations (10)
- (b) Explain design procedure of circular form tool with neat sketches of graphical method (10)
6. (a) Explain the following (Any four) (10)
1. Differentiate orthogonal and oblique cutting
 2. Draw twisted drill and show the technical parts
 3. Machinability
 4. MRS and ORS
 5. Dynamometer
 6. Surface roughness based on tool geometry
