(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 mechanism of orthogonal metal cutting.

(b) Write short note on cutting tool materials

(c) Write short note on cutting fluids

(d) Explain crater wear and flank wear.

(e) 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 33^0 and a feed of 0.15mm/rev. The length of chip over one revolution of workpiece is 72mm. The cutting speed is 12.5m/mim . 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) velcity 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 maching 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)**

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5. **(a)** Derive merchant's modified theory with usual notations **(10)**

(b) Explain design procedure of cicular form tool with neat sketche of graphical method **(10)**

6. **(a)** Explain the following **(Any four)** **(10)**
   1. Diffentiate orthogonal and oblique cutting
   2. Draw twisted drill and show the techinical parts
   3. Machinability
   4. MRS and ORS
   5. Dynamometer
   6. Surface rougness based on tool geomentry

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