

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. Explain the mechanism of tool wear.
- B. Explain working principle of strain gauge type 3D Milling dynamometer with the help of neat schematic sketch?
- C. Draw well labelled neat sketch and explain generation and distribution of heat during machining of material?
- D. Differentiate between orthogonal cutting and oblique cutting
- E. Explain orthogonal rake system in detail.
- F. Draw and explain the different terms of a twist drill.

Que. 2 A. The following data relate to the orthogonal cutting of mild steel Part: (10)

Cutting speed = 195 m/min.

Tool rake angle =  $12^{\circ}$

Width of cut = 1.75 mm.

Uncut thickness = 0.25 mm.

Average coefficient of friction between the tool and chip = 0.52

Shear stress of work material =  $385 \text{ N/mm}^2$

Calculate: (i) Shear angle.

(ii) Cutting and thrust components of the machining force.

- B. Give an example of alphanumeric specification (ISO coding system) for tipped tools and tool holders and explain it in brief? (10)

Que. 3 A. Explain steps involve in single point cutting tool design. (10)

- B. Derive an expression for optimum cutting speed and tool life for maximum production rate. Also write the assumptions associated to it. (10)

Que. 4 A. The following equation for tool life is given for a turning operation : (10)

$$V T^{0.14} f^{0.78} d^{0.38} = C$$

One hour tool life was obtained while cutting at  $V = 28 \text{ m/min}$  ;  $f = 0.3 \text{ mm/rev.}$  and  $d = 2.6 \text{ mm}$ . Calculate the change in tool life if the cutting speed, feed and depth of cut are increased by 25% individually and also taken together. What will be their effect on tool life?

B. What are the function of cutting fluid? Explain different types of cutting fluid. (10)

Que. 5 A. Explain various steps involved in the design of circular pull type broach. Draw the neat sketches. (10)

B. Discuss different cutting tool materials with their properties and application. (10)

Que. 6 A. Derive an expressions for merchant constant for orthogonal cutting taking into consideration effect of normal stress on shear plane. (10)

B. I) Explain Built Up Edge (BUE) formation and its influence on surface finish. (10)

II) Draw and explain design of simple step type chip Breaker.

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