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		Write Short Note on: <u>**Any four**</u> out of six.	(20)
	A.	Types of chips.	
	B.	Applications of Cutting fluids.	
	C.	Primary and secondary cutting edge finish.	
	D.	Tool wear mechanisms.	
	E.	Cutting tip and Chip breakers in carbide tools	
	F.	Multi-point Form tools.	

Que. 2 A. An orthogonal cut 2.5 mm wide is made at a speed of 0.5 m/sec and feed of 0.26   (10)
mm with a H.S.S. tool having a 20^0 rake angle. The chip thickness ratio is found
to be 0.58, the cutting force is 1400N and the feed thrust force is 360 N. Find: (i)
Chip thickness (ii) Shear plane angle   (iii) Resultant force (iv) Coefficient of
friction on the face of the tool (v) Friction force and normal force on the shear
plane (vi) Specific energy.

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

Que. 3 A. Prove that the relationship $2\emptyset + \beta - \alpha = \frac{\pi}{2}$ holds good in orthogonal   (10)
cutting, where $\emptyset$ = Shear angle, α = Rake angle, β = Friction angle. Also state
your assumptions.

          B. (i) Explain milling dynamometer with neat sketch.   (10)
             (ii) Write the ISO coding system for tipped tool (Insert)

Que. 4 A. Derive an expression for optimum cutting speed and tool life for maximum   (10)
production rate. Also write the assumptions associated to it

          B. (i) Discuss tool angles in ASA system with neat sketch   (10)
             (ii) Write the properties of cutting tool material and explain cubic boron nitride
(CBN).

Que. 5　A.　Discuss the following design features of a reamers: (10)

(i) Reaming allowance (ii) Diameter of Reamer (iii) Length of body (iv) Number of teeth (v) Rake angle and clearance angle.

B.　Explain the various steps involved in the design of circular broach and draw the neat diagram. (10)

Que. 6　A.　$VT^{0.20} = 640$ is the Taylor tool life equation for Carbide tool-steel workpiece obtained experimentally, where V is in m/min and T is in min. A batch of 1000 steel parts, each 100 mm in diameter and 250mm in length is to be rough turned using a feed of 0.2 mm/rev. If the cost per cutting edge of the throw-away carbide insert is Rs.60, time required to reset the cutting edge is 1 min and the total machine rate (including Operator cost) is Rs.300/hr. (10)

Calculate: (i) Optimum cutting speed for min. cost of production. (ii) Corresponding tool life. (iii) Total production cost if time taken to load & unload the component is 2 min and initial setup time is 2 Hrs. (iv) Total production time for the given batch.

B.　(i)　How is the tool shank of a single point cutting tool designed ? (10)

(ii) Explain synthetic and polycrystalline diamond (PCD).

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