University of Mumbai
Examination First Half 2022

Examinations Commencing from May/June 2022
Program: **TE Mechanical**
Curriculum Scheme: Rev 2019
Examination: BE Semester VI
Course Code: MEDLO6022 and Course Name: Tool Engineering
DATE: 31/5/2022   QP CODE: 94044

Time: 2 hour 30 minutes   Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Cutting conditions like large chip thickness, low cutting speed and small rake angle are favorable for producing following types of chips.
Option A:	Continuous chips
Option B:	Discontinuous chips
Option C:	Continuous chips with built up edge
Option D:	Segmental chips
2.	It is the angle between the portion of the side flank below side cutting edge and line perpendicular to base of the tool and measured at right angle to side flank is called as
Option A:	End relief angle
Option B:	Back rake angle
Option C:	Side relief angle
Option D:	Side rake angle
3.	In a single point cutting tool used for turning, the geometry as per ORS are : Inclination angle = 4^0, Orthogonal rake angle = 12^0 and Approach angle 75^0. What will be the value of side rake angle in ASA of tool nomenclature.
Option A:	10.60^0
Option B:	21.51^0
Option C:	12.59^0
Option D:	14.32^0
4.	Face milling includes axis of cutter --------- to work surface
Option A:	Normal
Option B:	Parallel
Option C:	Inclined
Option D:	Oblique
5.	Flank wear occurs mainly on which of the following
Option A:	Nose part and top face

CE8FC8BF836D3DA4C7A0BD14DC371075

Option B:	Cutting edge only
Option C:	Face of carrying tool at a short distance from the cutting edge
Option D:	Nose part, front relief face, and side relief face of cutting tool
6.	Which one of the following is the hardest cutting tool material next only to diamond ?
Option A:	Cemented carbides
Option B:	Ceramics
Option C:	Silicon
Option D:	Cubic boron nitride
7.	What is the variation of cutting speed with tool life on Log-Log scale?
Option A:	Parabolic variation
Option B:	Straight line variation
Option C:	Hyperbolic variation
Option D:	Elliptical variation
8.	Cutting fluids should possess --------- flash point
Option A:	Low
Option B:	Medium
Option C:	High
Option D:	Low to medium
9.	In a single point cutting tool used for turning, geometry as per ASA is: Back rake = 8^0, Side rake = 4^0, Side Cutting edge angle = 15^0. Find the value of inclination angle in ORS of tool nomenclature.
Option A:	5.7 degree
Option B:	6.5 degree
Option C:	7.5 degree
Option D:	6.7 degree
10.	With an increase in cutting speed, tool life ---------
Option A:	Increases
Option B:	Decreases
Option C:	Remains same
Option D:	May increase or decrease

Q2	Solve any Four out of Six 5 marks each
A	State the requirement of tool dynamometer and explain any one mechanical dynamometer.
B	Write the function of cutting fluid and also explain Cryogenic cooling.

C	Write short note on primary and secondary cutting edge finish.
D	Explain the regions of heat generation in metal cutting.
E	What are the functions of a chip breakers in metal cutting operation?
F	Draw a twist drill and explain all the angles of it.

Q3.	Solve any Two Questions out of Three 10 marks each
A	Prove that the relationship $2\emptyset + \beta - \alpha = \frac{\pi}{2}$ holds good in orthogonal cutting, where $\emptyset$ = Shear angle, α = Rake angle, β = Friction angle. Also state your assumptions.
B	For a metal machining following information is available: Tool changing time = 8 min, Tool regrinding time = 5 min, M/c running cost = Rs 30 / hr, Tool depreciation / regrind = Rs 1.2, Tool life equation $VT^{0.25} = 150$. Calculate optimum cutting speed and tool life for minimum cost of production.
C	Explain the various steps involved in the design of circular broach and draw the neat diagram.

Q4. A	Solve any Two 5 marks each
i.	How is the tool shank of a single point cutting tool designed ?
ii.	Explain the design procedure for the milling cutter.
iii.	Write the properties of cutting tool material and also explain Polycrystalline diamond (PCD).
B	Solve any One 10 marks each
i.	During machining of C - 25 steel with 0 - 10 - 6 - 6 - 75 - 90 -1 mm (ORS) shaped tripple carbide cutting tool. The following observation have been made. Depth of cut = 2 mm Feed = 0.2 mm/rev Speed = 200 m/min Tangential cutting force =1600 N Feed Thrust force = 850 N Chip thickness = 0.39 mm Calculate: i) Shear angle ii) Normal force at shear plane iii) Friction force iv) Kinetic coefficient of friction v) Specific cutting energy vi) Friction angle vii) Cutting power viii) Shear strain.
ii.	Derive an expression for optimum cutting speed and tool life for maximum production rate. Also write the assumptions associated to it.