TOOL ENGINEERING
(MECH 3239)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) A cutting tool will remove material efficiently if the rake angle is
(a) positive (b) negative
(c) zero (d) no relation to rake.

(ii) Toughness of a cutting tool means ability to withstand _____ without failure.
(a) high temperature (b) wear
(c) impact forces (d) chemical reaction

(iii) There are two rake angles of a lathe cutting tool in ASA system. These are:
(a) front rake and back rake (b) top rake and bottom rake
(c) back rake and side rake (d) left rake and right rake.

(iv) The relief angle given behind the cutting lips is called
(a) lip clearance angle (b) helix angle
(c) rake angle (d) chisel edge angle.

(v) Twist drill flank surface is ground by
(a) flat surface grinding (b) cylindrical surface grinding
(c) conical surface grinding (d) none of these.

(vi) In blanking operation dimension of the punch is
(a) equal to the size of blank (b) smaller than size of the blank
(c) die is larger than blank size (d) die is same as punch size.

(vii) Which one of the following is the hardest cutting tool material?
(a) Diamond (b) Ceramics
(c) Cermets (d) Cemented carbide.

(viii) Jigs are not used in
(a) drilling (b) reaming
(c) tapping (d) milling.

(ix) Which of the following can't be done by 'Go' plug gauges?
(a) Ensure bore alignability (b) Controls diameter
(c) Check straightness of hole (d) Check degree of ovality.

(x) 'Go limit' applied to which limit condition?
(a) Maximum material limit
(b) Minimum material limit
(c) Lower limit of shaft and upper limit of hole
(d) Moderate material limit.

Group- B

2. (a) Discuss the importance of cutting tool in manufacturing industry. *[(CO1)(Remember/LOCQ)]*

(b) Name different tools used in a Lathe. Differentiate between single point and multiple point cutting tools giving neat sketches for one of each type. *[(CO2)(Understand/LOCQ)]*

3 + (3 + 6) = 12

3. (a) What is work hardening tool steel? Name some non-ferrous tool materials with their usage. *[(CO2)(Remember/LOCQ)]*

(b) Write down the compositions of High Speed Tool Steel and Cemented Carbide insert and their purpose of use. *[(CO2)(Understand/LOCQ)]*

(2 + 4) + (3 + 3) = 12

Group – C

4. (a) Show with orthographic projection, different rake angles and clearance angle of a single point cutting tool in ASA system. *[(CO2)(Understand/LOCQ)]*

(b) Write steps of drawing master line for rake angle of a single point tool whose specifications are given in ORS system. *[(CO2)(Understand/LOCQ)]*

6 + 6 =12

5. (a) Find out back rake and side rake angle for a tool having 0° inclination angle, 10° orthogonal rake and 30° principal cutting edge angle. *[(CO2)(Analyse/IOCQ)]*

(b) Draw a face milling cutter and show its different geometrical features. *[(CO2)(Understand/LOCQ)]*

6 + 6 = 12

Group - D

6. (a) Write down the process of manufacturing HSS Turning tool. *[(CO3)(Remember/LOCQ)]*

(b) Explain with suitable diagrams the method of sharpening a HSS Turning tool. *[(CO3)(Remember/LOCQ)]*

6 + 6 = 12

7. (a) Describe the limits of application when comparing tungsten-carbide and titanium-carbide cutting tools. *[(CO4)(Understand/LOCQ)]*

   (b) Discuss the process of Press Tool Die manufacturing with mention of machines used for the purpose. *[(CO3)(Understand/LOCQ)]*

6 + 6 = 12

Group – E

8. (a) What are the purposes of using jigs and fixtures in batch production using machining? *[(CO5)(Understand/LOCQ)]*

   (b) What are the basic elements of jigs and fixtures? *[(CO5)(Understand/LOCQ)]*

6 + 6 = 12

9. (a) Describe briefly with the help of suitable sketches the methods of locating blank in fixtures by using
   (i) Flat surfaces
   (ii) Pre-machined hole
   (iii) Mandril or plug. *[(CO5)(Understand/LOCQ)]*

   (b) What are the seven basic elements of workpiece geometry that gauges are designed to check? *[(CO6)(Understand/LOCQ)]*

6 + 6 = 12

Cognition Level	*LOCQ*	*IOCQ*	*HOCQ*
Percentage distribution	*93.75*	*6.25*	*0*

Course Outcome (CO):

After the completion of the course students will be able to

1. Explain basic tool design and manufacturing concepts, materials used for manufacturing various tools.
2. Discuss design features of various types of tools used in the manufacturing industry.
3. Describe tool manufacturing methods for various types of HSS tools used in industry.
4. Describe production methods of carbide tools and Press tools.
5. Design Jigs and fixtures for various work holding and machining situations.
6. Design and manufacture Inspection Gauges.

**LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*