

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) Which is a single point cutting tool?
(a) Milling cutter (b) Twist Drill
(c) Boring tool (d) Broaching tool.
- (ii) Point angle relates to geometry of
(a) Threading tool (b) Twist Drill
(c) Parting tool (d) Grooving tool.
- (iii) 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.
- (iv) In upmilling chip thickness
(a) increases with rotation of cutter tooth after engagement
(b) decreases with rotation of cutter tooth after engagement
(c) remains constant throughout
(d) increases with speed of rotation.
- (v) Hob Cutter has a tooth profile of a
(a) Involute teeth (b) Rack teeth
(c) Cycloidal teeth (d) Spiral teeth.
- (vi) Profile sharpened Milling Cutters are ground by
(a) Form Relieve grinder (b) Pedestal grinder
(c) Tool and cutter grinder (d) Conical grinder.
- (vii) Jigs and fixtures are used for
(a) piece production (b) batch production
(c) mass production (d) all of the above.

- (viii) Bushes are generally provided in a jig to
(a) locate the job (b) guide the tool
(c) hold the job (d) all of the above.
- (ix) The most common limit gauge used for inspecting the hole diameter is
(a) snap gauge (b) ring gauge
(c) plug gauge (d) master gauge.
- (x) What is the use of 'No Go' gauges?
(a) Check a single element of a feature
(b) Check several dimensions simultaneously
(c) Check roundness and size at the same time
(d) Check location and size at the same time.

Group - B

2. (a) What is Tool Engineering? Discuss the role of a Tool Engineer.
[[CO1](Understand/LOCQ)]
(b) Define cutting tool in relation to metal cutting. Discuss the ways cutting tool is used in machining metals and alloys.
[[CO2](Remember/LOCQ)]
(3 + 3) + (3 + 3) = 12
3. (a) Name and discuss the different properties of Tool Materials considered for their selection.
[[CO2](Remember/LOCQ)]
(b) Give composition (one each) of Tool Steel, Non ferrous Tool, Non Metallic Tool materials.
[[CO3](Understand/LOCQ)]
6 + 6 = 12

Group - C

4. (a) Discuss on the various geometrical features of a Turning tool and a Twist drill with necessary sketches.
[[CO2](Remember/LOCQ)]
(b) Explain with necessary analysis why axial rake angle (γ_x) varies along the cutting edge from chisel edge diameter to outer diameter of a Twist Drill.
[[CO2](Analyze/LOCQ)]
(3 + 3) + 6 = 12
5. (a) Describe a Slab milling cutter showing its geometrical features (neat sketch required).
[[CO3](Understand/LOCQ)]
(b) Differentiate between Profile sharpened and Form relieved milling cutters giving necessary sketches.
[[CO3](Analyze/IOCQ)]
6 + 6 = 12

Group - D

6. (a) Explain with suitable diagrams the method of sharpening a HSS Slab Milling Cutter.
[[CO3](Understand/LOCQ)]

(b) How an Involute Gear Milling Cutter is sharpened? Explain with necessary sketches. [[CO3](Remember/LOCQ)]

6 + 6 = 12

7. (a) Describe the production process of Tungsten Carbide tools.

[[CO4](Understand/LOCQ)]

(b) Differentiate between progressive die and compound die in press work.

[[CO4](Analyze/IOCQ)]

6 + 6 = 12

Group - E

8. (a) Discuss Box jigs and Indexing jigs with a schematic diagram.

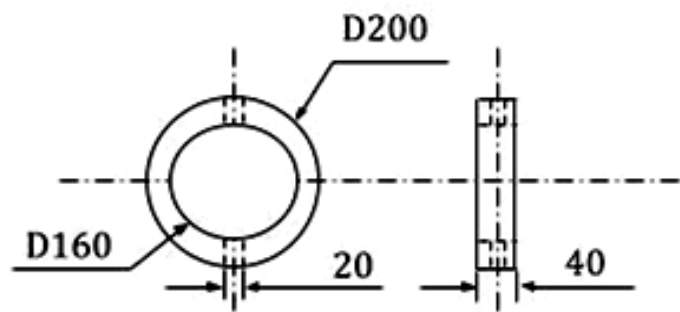
[[CO5](Understand/LOCQ)]

(b) Discuss Taylors principle of gauging.

[[CO6](Understand/LOCQ)]

8 + 4 = 12

9. Design a jig for drilling two equi-spaced radial through holes in a ring as shown below.



All the dimensions are in Millimeter

[[CO5](Create/HOCQ)]

12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	75	12.5	12.5

Course Outcome:

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