

B.E. (Mechanical Engineering) Seventh Semester (C.B.S.)

Elective - I : Tool Design

P. Pages : 2

Time : Three Hours



NRT/KS/19/3553

Max. Marks : 80

- Notes :
- All questions carry marks as indicated.
 - Solve Question 1 OR Questions No. 2.
 - Solve Question 3 OR Questions No. 4.
 - Solve Question 5 OR Questions No. 6.
 - Solve Question 7 OR Questions No. 8.
 - Solve Question 9 OR Questions No. 10.
 - Solve Question 11 OR Questions No. 12.
 - Due credit will be given to neatness and adequate dimensions.
 - Assume suitable data whenever necessary.
 - Illustrate your answers whenever necessary with the help of neat sketches.
 - Use of non programmable calculator is permitted.
 - Use of design data book is permitted.

1. a) Draw a neat sketch of single point cutting tool and explain importance of its various angles? **5**
- b) In an orthogonal cutting operation following data have been observed: **9**
- Uncut chip thickness = 0.125 mm
Width of cut = 6.30 mm
Cutting speed = 1.75 M/sec
Rake angle = 20°
Cutting force = 550 N
Thrust force = 225 N
Chip thickness = 0.225 mm
- Determine:
- | | |
|-----------------------------------|---------------------------------|
| a) Shear angle | b) Friction angle |
| c) Shear stress along shear plane | d) Power for cutting operation. |
2. a) The following equation for tool life is given for a turning operation: **8**
- $$VT^{0.13} \cdot F^{0.77} \cdot d^{0.37} = C$$
- A 60 minute tool life was obtained while cutting at V = 30 m/min, f = 0.3 mm/rev and d = 2.5 mm. Determine change in tool life if 'V', 'f' and 'd' are increased by 25% individually and also taken together.
- b) State and explain factors on which tool wear and tool life depends? **6**
3. a) Discuss generalized design process and considerations used to design tool shank of single point cutting tool. **7**
- b) Draw neat sketch of twist drill to show its geometry and the following terms related to twist drill? **6**
- | | |
|-----------------|-----------------|
| i) Lip angle | ii) Helix angle |
| iii) Land width | iv) Back Taper |

4. a) The following data is given for slab milling operation: 8
Cutter diameter = 150 mm
No. of teeth = 10
Width of cutter = 60 mm
Length of Job = 50 mm
Depth of cut = 3 mm.
Table speed = 0.6 m/min
cutter speed = 100 rev/min
Find: MRR, power, consider machinability factor for Job as $8.2 \text{ cm}^3/\text{min}/\text{hpc}$
- b) What are form tools? Discuss its design features? 5
5. a) Explain how capacity of mechanical and hydraulic press is determined? 5
- b) Find the total pressure and dimensions of punch and die to produce a washer of 30 mm outside diameter and 15 mm inside diameter. from 2.5 mm thick sheet of steel having shear strength of $300 \text{ N}/\text{mm}^2$. 8
6. a) Draw and explain with neat sketch compound die used in press working. 6
- b) State and explain methods of reducing cutting force in press working. 7
7. a) Explain V-bending and U-bending die with neat sketch. 5
- b) A cup having internal diameter 50 mm and height 75 mm is to be manufactured from 1 mm thick steel sheet of SAE 1010. Calculate : 8
i) Blank size ii) No. of draws
iii) Size of punches for each draw.
8. a) Explain with neat sketch difference between curling die and embossing die. 6
- b) What is spring back effect in bending operation? How allowances are made to compensate for its effects? 7
9. a) Compare between single impression and multi-impression die used in forging operation. 6
- b) Explain in detail procedure for designing forging dies. 7
10. a) Explain double acting steam Hammer used in forging operation with neat sketch. 6
- b) State and explain various allowances to be considered for forging die design. 7
11. a) Discuss basic principles for design of Jigs and fixture. 6
- b) Draw and explain with neat sketch any one standard lathe fixture. 8
12. a) Why Jig bushes are needed? Draw and explain any two types of Jig bushes. 6
- b) Design an indexing Jig for drilling six equally spaced radial holes of 10 mm diameter on 'PCD of 80 mm in circular plate of mild steel having 110 mm diameter and 40 mm thickness. The work-piece has an central hole of 20 mm diameter. Draw dimensional sketch. 8
