

Roll Number: \_\_\_\_\_

*Thapar Institute of Engineering & Technology, Patiala*  
Department of Mechanical Engineering  
Mid Semester Examination  
March, 2018

BE- 4<sup>th</sup> Semester

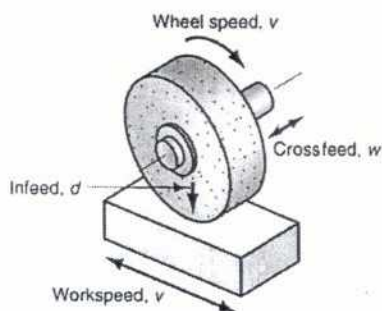
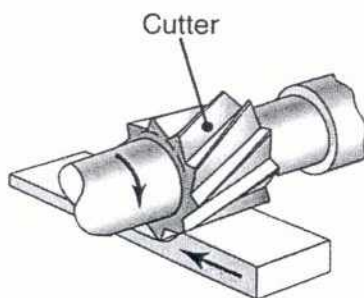
Time: 02 Hours; MM: 60

UTA002: Manufacturing Processes

Name of Faculty: VJ, DG, ATS, HNV, GLK, APS, RSJ,  
RK, SAT

**NOTE:** Do all questions in sequence; assume suitable missing data, if any.  
Mention your group number on the top of answer sheet.  
Support your answers with neat sketches wherever required.  
All questions are compulsory and carry equal marks.  
Use handout for Q 3 (a).

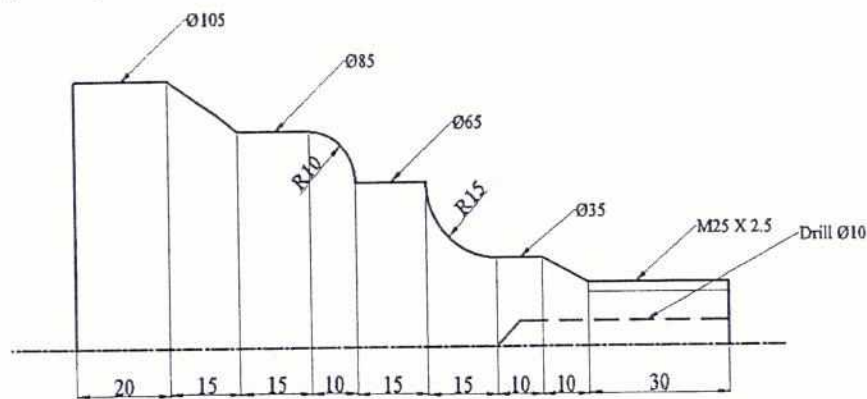
- |   | Marks |
|---|-------|
| Q1. (a) What is chip thickness ratio in metal cutting? Schematically show the various shear zones during cutting process.   | 05    |
| (b) Schematically show the grinding wheel structure and explain its significance.   | 05    |
| (c) A cylindrical part of 50 mm diameter is to be turned down to 48 mm diameter on a standard lathe. The length of the workpiece to be turned is 200 mm and the tool has a pre-travel of 5 mm. The feed is 0.1 mm/rev and the depth of cut is 1 mm. If the machine produces 50 parts per hour find (a) Cutting speed (corresponding to original diameter of the job) (b) Material removal rate.         | 10    |
| Q2. (a) Calculate the (a) Final length of the strip, (b) rolling force for Stainless steel strip rolled at 1000°C. The dimension of the initial material are 1000 mm long, 40 mm wide and 10 mm thick has to be rolled to the thickness of 7 mm. The width of the plate increases by 3%. The roll radius is 200 mm and it rotates at 200 rpm respectively. The flow stress of work material is 420 MPa. | 05    |
| (b) Graphically represent the effect of temperature on strength & ductility of the material during forming process.   | 03    |
| (c) What are the significant differences between the operations shown below:  | 04    |



- (d) The tool life equation for HSS tool is given by  $VT^{1/7} = C_1$  and for carbide  $VT^{1/5} = C_2$ . For a cutting speed of 24 m/min, the tool life for both the tools is 130 min. Compare the tool life of two cutting tools (HSS and carbide) at a speed of 30 m/min.

Q3. (a) Write a CNC part program for the given component using canned cycle. All dimensions in mm. Consider following parameters during machining: 15

- Spindle speed during turning, drilling and threading operation is 2000, 1000 and 500 rpm, respectively.
- Feed rate during rough and finish cycles in turning are 100 and 50 mm/min, respectively.
- The depth of cut during roughing operation is 0.5 mm and finishing allowance in both directions is 0.1 mm.
- Feed rate in drilling cycle is 60 mm/min.
- The incremental depth of cut and tool retract distance in drilling are 0.5 and 1 mm, respectively.
- The included angle of thread is 60°. No. of finishing passes are 5. Finishing allowance is 10  $\mu\text{m}$ . Minimum and maximum depth of cut for threading is 50 and 100  $\mu\text{m}$ , respectively.



(b) According to ASA system (machine reference system), identify all the 7 tool parameters in tool signature: 1-8-9-12-16-15-0.7 and show them (three views) on a single point tool. 05

#### Hand Out

G00 X\_ Z\_ – Rapid transverse  
 G01 X\_ Z\_ F\_ – Linear motion with feed  
 G02 X\_ Z\_ R\_ F\_ – Tool movement in clockwise direction  
 G03 X\_ Z\_ R\_ F\_ – Tool movement in anti-clockwise direction  
 G20 – Inches mode  
 G21 – Metric mode  
 G28 U\_ W\_ – Go to machine home position in incremental mode  
 G98 – Feed in mm/min  
 G99 – Feed in mm/rev  
 U – Incremental mode in X- axis  
 W – Incremental mode in Z- axis  
 X – Absolute mode in X- axis  
 Z – Absolute mode in Z- axis  
 Multiple turning cycle: G71 U\_ R\_ G71 P\_ Q\_ U\_ W\_ F\_  
 Finishing cycle: G70 P\_ Q\_ F\_  
 Drilling cycle: G74 R\_ G74 X\_ Z\_ Q\_ F\_  
 Threading cycle: G76 P(m) (r) (a) Q\_ R\_ G76 X\_ Z\_ P\_ Q\_ F\_  
 M03 – Spindle rotation in clockwise direction  
 M04 – Spindle rotation in anti-clockwise direction  
 M05 – Spindle stop  
 M06 – Tool change  
 M30 – Program Stop and Rewind