

Roll Number: _____

Thapar University Patiala
Department of Mechanical Engineering
Mid Semester Examination
March, 2017

BE- 4th Semester

Time: 02 Hours; MM: 60

UTA002: Manufacturing Processes

Name of Faculty: VJ, DG, ATS, ATD, HNV, DM,
RKS, GK

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 Q4 (b).

- Q1 (a) The part shown in Fig. 1 will be turned in two machining steps. In the first step a length of (50+50)=100mm will be reduced from $\Phi 50$ mm to $\Phi 40$ mm and in the second step a length of 50 mm will be reduced from $\Phi 40$ mm to $\Phi 30$ mm. Calculate the required total machining time, T, with the following cutting conditions:
Cutting speed (V)=40 m/min,
Feed (f)=0.8 mm/rev,
Depth of cut (doc) = 2.5 mm per pass. [8]

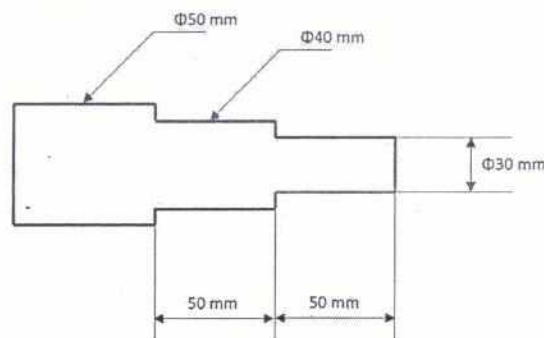
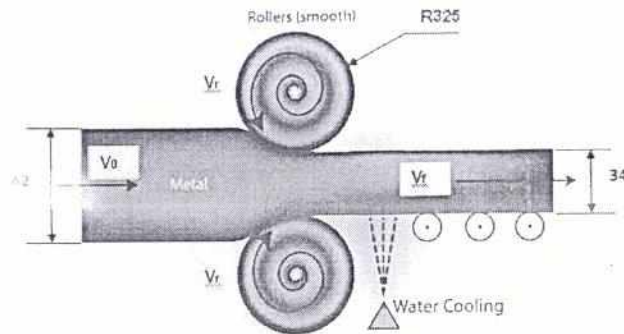


Fig. 1.

- (b) What is Tool signature 8-14-6-12-14-12-0.8 represents? Draw neat sketch of positive, negative and zero rake angle. Suggest suitable type of rake angle for machining of Cast Iron and Aluminum work material. [3.5+1.5+2]
- Q2 (a) What do you understand by grinding wheel wear? Describe the different wear mechanisms involved in the grinding operation. Also mark the different wear regions on a wear curve. [1+3+3]
- (b) In turning operation of a steel rod with a single point cutting tool (for a given machining and environmental conditions), the tool life decreases from 80 min to 20 min with change in cutting speed (V) from 60 m/min to 120 m/min. Determine the cutting velocity at which the life of that tool will be 40 min under the same conditions? [8]
- Q3 (a) Compare hot working and cold working processes with proper justification in terms of
- Temperature range of the process,
 - Surface finish of the final product,
 - Dimensional control, and
 - Forces required to initiate and complete the deformation process.
- [1+2+2+2]

- (b) A 42 mm thick plate made of low carbon steel is to be reduced to 34 mm in one pass in a rolling operation as shown in Fig. 2. As the thickness is reduced, the plate widens by 4%. The yield strength of the steel plate is 174 MPa and the tensile strength is 290 MPa. The entrance speed of the plate is 65 m/min and the rotational speed is 29 rev/min. Determine
- The minimum required coefficient of friction that would make this rolling operation possible,
 - Exit velocity of the plate, and
 - Forward slip.
- [3+3+2]



(All dimensions are in mm)

Fig. 2.

- Q4 (a) What are the desirable characteristics required for the selection of appropriate cutting tool materials? [5]
Mention at least five characteristics.
- (b) Write the manual part program for making a slot of depth 2 mm and width 5 mm in an aluminium block [10]
as shown in Fig. 3. Consider tool rotational speed, feed rate and diameter of end mill cutter as 2000 rpm, 100 mm/min and 5 mm, respectively. Also show the workpiece reference point with proper diagram.

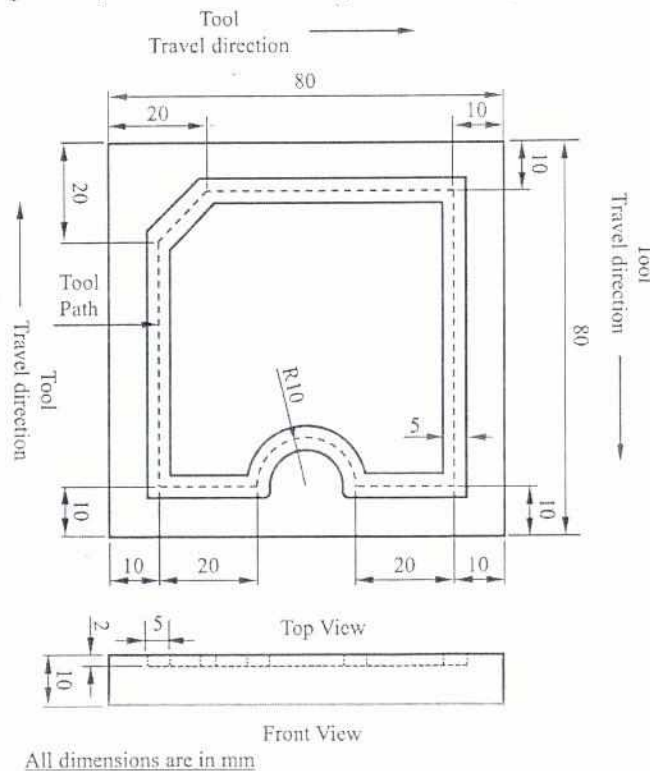


Fig. 3.

HAND OUT:

G00 X_ Y_ Z_ – Rapid transverse
G01 X_ Y_ Z_ F_ – Linear motion with feed
G02 X_ Y_ Z_ R_ – Tool movement in clockwise direction
G03 X_ Y_ Z_ R_ – Tool movement in anti-clockwise direction
G20 – Inches mode
G21 – Metric mode (in mm)
G28 – Go to machine home position in incremental mode
G43 H1 – Height offset of the tool in downward direction
G90 – Absolute method
G91 – Incremental method
G94 – Feed in mm/min
G95 – Feed in mm/rev
X – Absolute mode in X- axis
Y – Absolute mode in Y- axis
Z – Absolute mode in Z- axis
M03 – Spindle rotation clockwise
M04 – Spindle rotation anti-clockwise
M05 – Spindle stop
M06 – Tool change
M30 – Program Stop and Rewind
M98 – Sub program calling
M99 – Sub program end