Thapar Institute of Engineering & Technology
Department of Mechanical Engineering
Mid Semester Examination
5th March, 2020

BE- 2nd /4th Semester
Time: 02 Hours; MM: 50

UTA002: Manufacturing Processes
Name of Faculty: VJ, DM, RTK, DWR, SS, RSJ, SAT, ATS, RP, KPKC, APS

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 Que 1 and Que 2.

			Mark
Q1.		Write a CNC turning part program for aluminum component shown in **Figure 1** using canned cycles. All dimensions shown in figure are in mm. • Spindle speeds during turning and drilling are 1500 and 900 rpm respectively. • Feed rates during rough and finish cycle are 80 and 40 mm/min respectively. • Depth of cut during roughing cut (turning) is 0.5 mm and finishing allowance is 0.1 mm in both direction with 0.5 mm tool retract. • 3 mm facing is required with 1 mm depth of cut using 40 mm/min feed rate. • Incremental depth of cut and tool retract in drilling are 0.5 mm and 1 mm respectively with feed rate of 50 mm/min.	10
Q2		Write a CNC milling part program to machine the profile shown in **Figure 2** for 80 x 50 x 10 mm mild steel plate. Tool follows the path A - B - C ---------- K - L - A. Depth of the profile to be cut is 3 mm. End mill of 4 mm diameter is used with 1400 rpm spindle speed and feed rate of 50 mm/min.	08
Q3.		Figure 3 shows a type of chip formed while turning Aluminum with a single point cutting tool. What are the ideal **machining conditions** that promote this kind of chip formation? Why is it essentially required to break this kind of chips? What is the working principle of the device used for it? State and draw the schematic of each device.	08

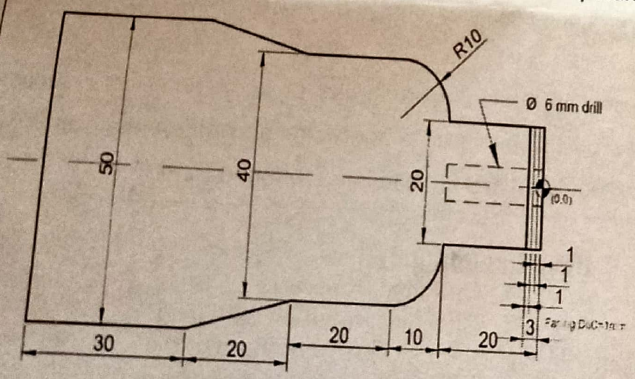


Fig. 1

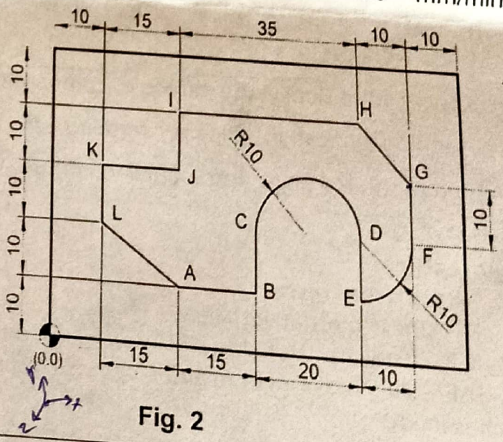


Fig. 2

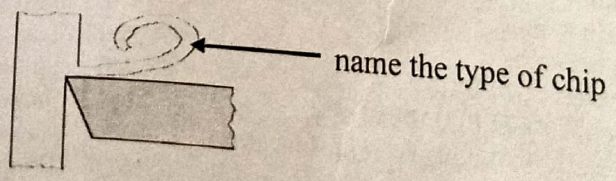
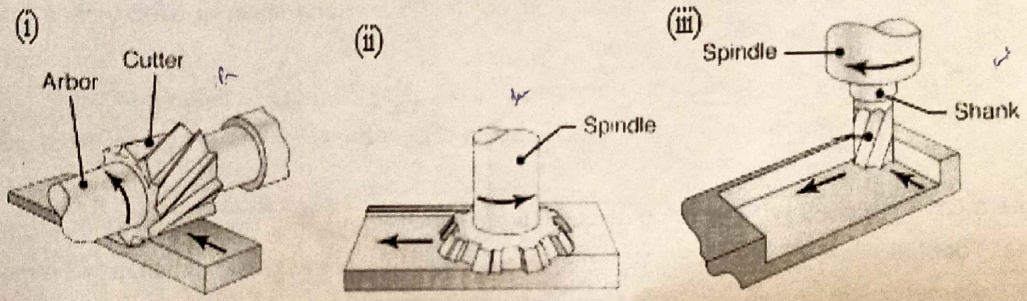


Fig. 3

Q4		An aluminum flashlight has to be turned on a lathe machine from a raw material of 40 mm length and 12 mm diameter, which is 38 mm in length and 9.5 mm diameter. Assume the feed of the operation f = 0.25 mm/rev, depth of cut 2.5 mm, and spindle speed is 850 rpm. Calculate the material removal rate of the operation. Also, estimate the tool life when high-speed steel is used as tool material. How many such components would you be able to manufacture before the tool needs to be replaced? Use Table 1 for solving question.	12

		C			
		Nonsteel Cutting		Steel Cutting	
Tool Material	n	m/min	(ft/min)	m/min	ft/min
Plain carbon tool steel	1.1	70	(200)	20	60
High-speed steel	1.125	175	(350)	70	200
Cemented carbide	1.25	900	(2700)	500	1500
Cermet	1.25			600	2000
Coated carbide	1.25			700	2200

Q5	(a)	Identify the milling process and state which type of milling cutter you will use for following operations:	03



Make a schematic for two types of milling operations classified on the basis of relative direction of cutter and work table.

	(b)	Show graphically the effect of temperature on two desirable properties of a material for a successful forming operation. Classify forming processes on the basis of temperature and differentiate them w.r.t. temperature range, force applied, surface finish obtained and tool life in a tabulated form.	06

Hand Out (Lathe)

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 (in mm)
G28 U_ W_ – Go to machine home position in incremental mode
G98 – Feed in mm/min
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_
G70 P_ Q_ F_ – Finishing cycle
Facing Cycle: G94 X_ Z_ F_
Drilling cycle: G74 R_
G74 X_ Z_ Q_ F_

Hand Out (Milling)

G00 X_ Y_ Z_ – Rapid transverse
G01 X_ Y_ Z_F_– Linear motion with feed
G02 X_ Y_ Z_R_– clockwise rotation of tool
G03 X_ Y_ Z_R_– anti-clockwise rotation of tool
G21 – Metric mode (in mm)
G28 X_ Y_ Z_–home position
G43 H1 – Height offset of tool in downward direction
G90 – Absolute method
G91 – Incremental method
G94 – Feed in mm/min,

Miscellaneous code (common)

M03 – Spindle rotation in clockwise direction
M04 – Spindle rotation in anti-clockwise direction
M05 – Spindle stop
M06 – Tool change
M30 – Program Stop and Rewind