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Roll Number:_____

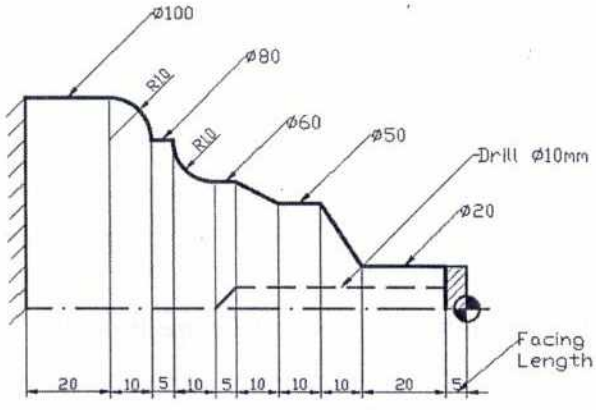
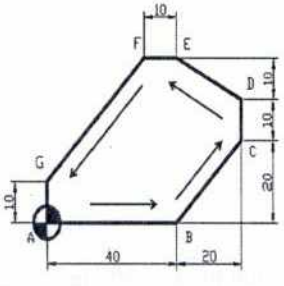
Thapar University Patiala
Department of Mechanical Engineering
Mid Semester Examination
20th Sept., 2017

BE- 4th Semester
Time: 02 Hours; MM: 60

UTA002: Manufacturing Processes
Name of Faculty: VJ, DG, ATS, NHV, DM, GLK, 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 Q 3 (a).

			Marks
Q1	(a)	From a raw material of 100 mm length and 10 mm diameter, a component having length 100 mm and diameter 8 mm is to be produced in a single pass using a cutting speed of 31.41 m/min and a feed of 0.7 mm/revolution. The workpiece rotates at 1000 rpm. How many times we have to re-sharpen/regrind or replace the cutting tool, if 1000 work-pieces are to be produced. In the taylor's expression use constants as n = 1.2 and C =180.	**10**
	(b)	Explain in detail, the basic parameters required for specifying the grinding wheel for a given application.	**08**
	(c)	A cylindrical stainless steel rod with length L=150 mm, diameter D_0 = 12 mm is being reduced in diameter to D_f =11 mm by turning on a lathe. The spindle rotates at N = 400 rpm, and the tool is travelling at an axial speed of 200 mm/min. Calculate: (a) The cutting speed V (maximum and minimum) (b) The material removal rate MRR (c) The cutting time 't' (d) The power required if the unit power is estimated to 4 W.s/mm^3	**05**
Q2	(a)	A rolling mill used to roll a strip from t_o=2.0 mm to t_f=1.5 mm, strip-width of w=500 mm and 10 ft long. The rollers are driven at angular speed of N=50 rpm. Calculate rolling force required when roll diameter is changed from D_1=500 mm to D_2=300 mm. Given material follow stress $\sigma = 150\ (\varepsilon)^{0.25}$ N/mm^2, Where ε is the strain rate and can be calculated as $\varepsilon = -ln\left({}^{t_f}/_{t_o}\right)$.	**05**
	(b)	Identify the different classifications of metal forming processes. What is no slip point in relation to a rolling operation?	**2, 1**
	(c)	With the help of neat and clean schematic, distinguish between up and down milling.	**4**

Q3	(a)	Write a CNC part program of the given profile **(refer Fig. 1)** for its manufacturing on CNC Lathe. Consider the following parameters during machining: i. Tool pre-travel allowance is 2 mm. ii. Spindle speed during turning and drilling operation are 1500 and 1000 rpm, respectively. iii. Feed rate during roughing and finish operations in turning cycle are 120 and 60 mm/min, respectively. iv. Feed rate in drilling is 50 mm/min. iii. The workpiece has to face of 5 mm before other operation. iv. In turning operation, the depth of cut during roughing is 0.5 mm and finishing allowance on X and Z is 0.1 mm. v. The depth of cut and tool retract distance in drilling operation are 1 and 2 mm, respectively.  **Fig. 1**	**10**
	(b)	1. Differentiate between absolute and incremental mode of programming in brief. 2. Mention the coordinates (A to G) of the machining path required to manufacture the given component **(Fig. 2)** in both absolute and incremental coordinate systems.  **Fig. 2**	**2, 3**
	(c)	What types of chips are expected while machining Aluminium alloy. Write all the conditions for obtaining such types of chips? Also, mention a few problems and the various methods to prevent these types of chips?	**3, 2**
	(d)	Define the tool signature of a single point cutting tool? Draw the neat sketch of a single point cutting tool indicating all its faces and cutting edges?	**2, 3**

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 (in mm)
G28 U_ W_ – Go to machine home position in incremental mode
G70 P_ Q_ F_ – Finishing cycle
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_

Drilling cycle: G74 R_
G74 X_ Z_ 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