

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VII Examination-Nov/Dec.-2011****Subject code: 172002****Date: 22/11/2011****Subject Name: Automated Manufacturing I****Time: 10.30 am-01.00 pm****Total marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) The following component is to be made using a CNC turning centre **07**
equipped with a FANUC OT controller. Write a complete manual part
program for machining of the component shown in figure1. The datum
is to be set as shown. Take Raw material of size $\Phi 40 \times 80$ mm. Limit
maximum spindle speed to 3000 RPM.

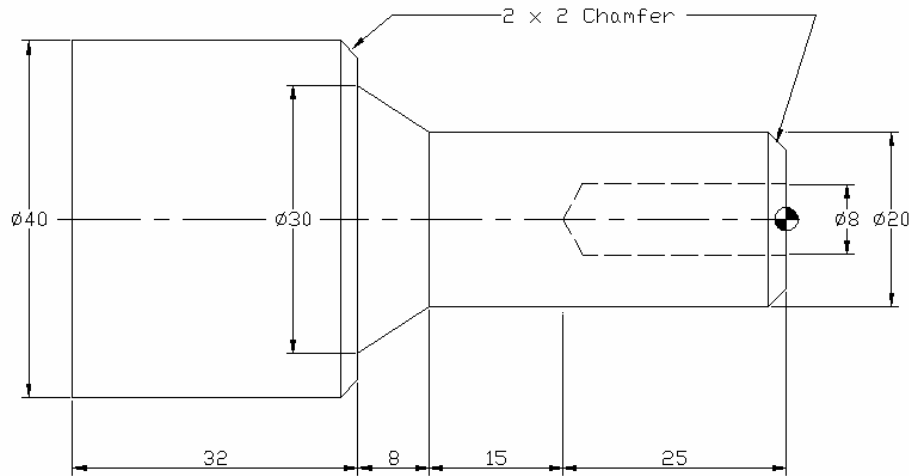


Figure 1

All Dimensions are in mm

The suggested route sheet is:

SN.	Operation	Tools	Cutting Speed	Feed mm/rev	Remark
1	Rough Turning (G71)	T03	200 m/min	0.20	Max DOC 2 mm
2	Finish Turning (G70)	T05	250 m/min	0.10	Max DOC 0.1 mm
3	Drilling (G74)	T04	25 m/min	0.15	$\Phi 8$ mm Drill

(b) Prepare the complete manual part program for profile milling on a **07**
Vertical Milling Machine for the component shown in figure.2. The
machine is fitted with ATC and has FANUC Controller. Start profile
milling with the position of cutter at A and follow the path A-B-C-D-E-
F-G-H-K-A. Use appropriate cutter radius compensation. Take Billet of
size 140 x 170 x 10 mm. Consider part zero at point A.

The suggested cutting parameters:

SN.	Operation	Tools	Cutting Speed	Feed mm/min	Remark
1	Profile cutting	T03	1200 RPM	50	$\Phi 10$ End Mill

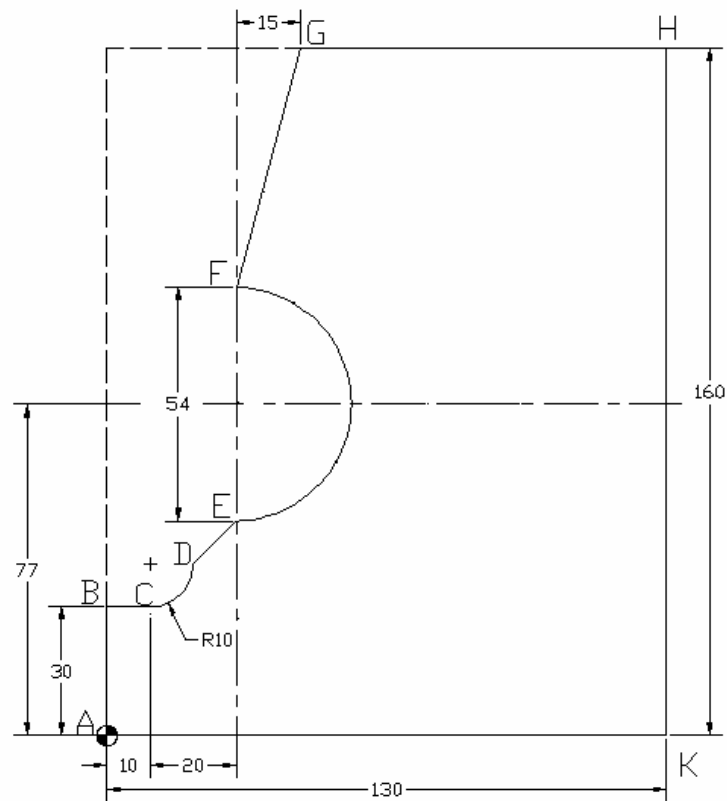


Figure 2

All Dimensions are in mm

- Q.2 (a)** Explain with block diagram Open Loop and Closed Loop Control System. **07**
- (b)** Sketch and explain the relative motion between the tool and the spindle rotation for cutting left hand and right hand threads on Turning Centre. Why constant surface speed feature should be disabled during thread cutting? **07**

OR

- (b)** Define and classify automation. Explain reasons for automating. Graphically show the relation between product quantity, variety and type of automation. **07**

- Q.3 (a)** The worktable in an NC positioning system is driven by leadscrew with a 4 mm pitch. The leadscrew is powered by a stepping motor that has 200 step angles. The work table is programmed to move a distance of 100 mm from its present position at a travel speed of 300 mm/min. (a) How many pulses are required to move the table the specified distance? (b) What are the required motor speed and (c) pulse rate to achieve the desired table speed? **07**
- (b)** Describe the types of positioning control systems in NC/CNC machines. **07**

OR

- Q.3 (a)** A stepping motor with 200 step angles is coupled to a leadscrew through a gear reduction of 4:1 (4 rotations of the motor for each rotation of the lead screw). The leadscrew has 2.5 threads/cm. The worktable is driven by the leadscrew must move a distance = 25.0 cm at a feedrate of 15 cm/min. Determine (a) the number of pulses required to move the table, (b) the required motor speed, and (c) the pulse rate to achieve the desired table speed. **07**
- (b)** Why friction guideways are not used in CNC Machine tools? What are the advantages of LM guideways and roller screws? **07**

- Q.4 (a)** Explain following terms in context to Automated Guided Vehicles. **07**
1. Vehicle's acquisition distance
 2. Dead reckoning and beacons
 3. Frequency select method
- (b)** Explain with sketch retrieval type of Computer Aided Process Planning. **07**
- OR**
- Q.4 (a)** Explain different CMM controls. **07**
- (b)** Explain concurrent engineering with block diagram. **07**
- Q.5 (a)** Write in brief. **07**
1. Reverse Engineering
 2. Stereolithography
 3. Class based dedicated storage strategy of AS/RS
- (b)** An automated guided vehicle system has an average travel distance per delivery = 200 m and an average empty travel distance = 150 m. Load and unload times are each 24 sec and the speed of the AGV = 1 m/s. Traffic factor = 0.9 How many vehicles are needed to satisfy a delivery requirement of 30 del/hr? Assume $A=0.95$. **07**
- OR**
- Q.5 (a)** What is rapid prototyping? What are the applications of it? Explain Selective Laser Sintering. **07**
- (b)** An automated storage/retrieval system for work-in-process has *four* aisles. The storage racks in each aisle are 20 m high and 100 m long. The S/R machine for each aisle travels at horizontal speed of 2.0 m/sec and vertical speed of 0.4 m/sec. Pick-and-deposit time = 15 sec. AS/RS uses class-based dedicated storage strategy. There are two classes, according to activity level. The more-active stock is stored in the half of the rack systems that is located in closest to the input/output station, and the less active stock is stored in the other half of the rack system, farther away from the input/output station. Within each half of the storage system, random storage is used. The more active stock accounts for 75% of the transactions, and the less-active stock accounts for the remaining 25%. Assume that the system utilization is 90% and the number of single command cycles are equal to *two times* the number of dual command cycles in each half of the AS/RS. Determine the throughput of the AS/RS, basing the computation of cycle times on the same kinds of assumptions used in MHI method. **07**
