



Name :

Roll No. :

Invigilator's Signature :

CS/M.Tech (PE)/SEM-2/PEM-201/2011

2011

AUTOMATION IN MANUFACTURING

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any five questions. $5 \times 14 = 70$

1. a) Considering economic consideration, briefly discuss the applicability of fixed and flexible automated machining systems. 4
- b) What a Geneva wheel ? Derive the expression for obtaining activation by a specified rotation angle of shaft using a Geneva wheel. 5
- c) Differentiate between a Swiss lathe, automatic lathe and a multi-spindle machine tool. 5
2. a) Select suitable tools for making a tooling list for undertaking a knurled headed M 50 bolt having a ϕ 8mm hole inside the threaded position on a turret lathe. Give sketches of respective positions of tools in tool posts. 8
- b) Discuss the role of collect chuck and cams in a fixed automation machine tool. List the types of collect chuck and cam used in such machine tool. 6



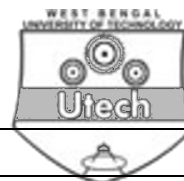
3. a) Sketch different types of transfer mechanism state uses of these mechanisms. 6
- b) For 'n' (= 9) number of different jobs, 'm' (= 8) number of manufacturing stations are to be involved as detailed in table. Find out the groupings using Production Flow Analysis method. State also the use of such grouping. 8

$\begin{matrix} m \\ n \end{matrix}$	1	2	3	4	5	6	7	8
1	X	X				X		X
2	X		X	X				X
3					X	X		
4	X			X			X	
5	X	X	X					
6	X			X			X	X
7		X	X		X			
8	X			X				X
9		X		X			X	

4. a) Compare Opitz system of part classification with the composite part-based part classification. Give example of any one method. 6
- b) How is GT concept helping in CAPP implementation. ? 4
- c) Give an example of expert system based generative CAPP system. 4
5. a) Discuss about the stages of CAD/CAM integration. 5
- b) Draw up the basis building blocks of a Computer Integrated Manufacturing System and state the role of control block in this system. 6
- c) Differentiate between a direct and a distributed DNC system. 3



6. a) State different uses of a CMM. Briefly discuss its principle of working. 6
- b) For controlling a gas flow piping system, pressure and temperature are to be kept within a maximum limit. State with reasons, the type of sensor-based that can be used there, mentioning the type of sensor of use. 5
- c) Give a schematic diagram of a process for the position control of a tool in a CNC machine, mentioning its components. 3
7. a) Write a brief note on different actuators of a robotic system. 5
- b) Show the work envelop of a humanoid robot arm by choosing a suitable degree of freedom. 5
- c) For a three degrees of freedom articulated robot arm, find out the forward kinematic equations. 4
8. a) Give a short description on Adaptive Control Constraint type system, citing an example. 5
- b) Write the process plan and corresponding part programme (G and M code based) for making multiple nos. of same component from long MS bars of 50 mm diameter. The job is having 48 mm diameter and 8 mm long knurled head at one end, and 40 mm long cylindrical portion with 24 mm diameter at the other end, that has small centre drill inside. Codes are given in table : 9



G00	Raid Positioning
G01	Linear interpolation
G81	Total cut depth; total cut length; cut per pass; length to pull in; length to pull out; Rapid in (1 or 0)
G82	Total faced off; total cut dia; cut per pass; dia to pull in; dia to pull out; Rapid in (1 or 0)-Rough facing cycle
G84	Thread depth; thread length; cutting passes; lead; lead changer; taper, pull out length; final depth passes; compound angle-Threading cycle
M30	Programme end with rewind
M03	CW spindle rotation
M04	CCW spindle rotation
M05	Spindle stop
M06	Tool change
Txxyy	Tool No. with offset No.
G94G71Fxx	Feed in mm/min unit
G95G71Fxx	Feed in mm/rev unit
G90	Absolute Programming; G91-Incremental Programming. If d is nominal thread diameter, root dia for external threads difference is $= 0.85d$

9. a) What are the applications of CNC in EDMing operations ? 3
- b) What are meant by FMC and FMM ? 3
- c) Write down the process chart and APT-based part programme for making four 10 mm diameter through holes at equal spacing on a 80 mm diameter disc of 5 mm thickness along a p.c.d. of 60 mm diameter, and for making a through slot of 20 mm in length that is centrally placed along an axis. 8