BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: B.E **SEMESTER : VI**
BRANCH: PROD **SESSION : SP/17**

SUBJECT: PE6007-MANUFACTURING AUTOMATION & ROBOTICS

TIME: 03:00 Hours **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) Differentiate between hard automation and soft automation [2]
Q.1(b) What are the benefits of automation? (any six) [4]
Q.1(c) Explain various types of automation as a function of product variety and production volume. [6]

Q.2(a) Enlist any four advantages of an NC system. [2]
Q.2(b) Discuss the basic elements of a NC system. [4]
Q.2(c) Explain constructional features and feedback devices for CNC machine tools. [6]

Q.3(a) In context to part programing what are modal and non-modal commands. [2]
Q.3(b) Discuss any four different ways of defining a point in APT. [4]
Q.3(c) Prepare complete CNC manual part program for turning a part shown in Fig1. The size of the initial blank is of 60 mm diameter and 90 mm length. Take 1 mm depth of cut for each pass. Assume suitable data for speed and feed. [6]

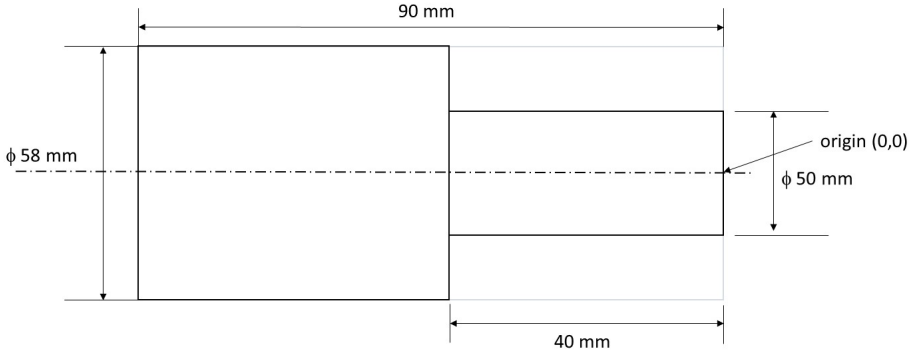


Fig 1

Q.4(a) Why storage buffers in production lines are necessary? [2]
Q.4(b) Discuss adaptive control with optimization (ACO) system of adaptive control of CNC machining. [4]
Q.4(c) Discuss with relevant figure the elements of a part delivery system of an automated assembly line. Explain with example what is a orientor and a selector. [6]

Q.5(a) What is Computer Integrated Manufacturing? [2]
Q.5(b) Enlist at least six benefits of implementing FMS. [4]
Q.5(c) Discuss with relevant figure the different types of FMS layouts. [6]

Q.6(a) Define a robot joint and link. [2]
Q.6(b) Discuss some of the robot application in manufacturing. [4]
Q.6(c) Explain following joint notation of Robot configuration for body and arm assembly TRL,TLO,LOO,TRR,VRO [6]

Q.7(a) Write short notes on: PLC, Robot sensors [4]
Q.7(b) A flexible manufacturing cell consists of two machining workstations plus a load/unload station. The load/unload station is station 1. Station 2 performs milling operations and consists of one server (one CNC milling machine). Station 3 has one server that performs drilling (one CNC drill press). The three stations are connected by a part handling system that has one work carrier. The mean transport time is 2.5 min. The FMC produces three parts A, B, and C. The part mix tractions and process routings [8]

PTO

for the three parts are presented in the table below. The operation frequency, f_{ijk} = 1.0 for all operations. Determine: (a) maximum production rate of the FMC, (b) corresponding production rates of each product, (c) utilization of each machine in the system, and (d) number of busy servers at each station

Part j	Part mix P_j	Operation k	Description	Station i	Process Time t_{ijk} (min)
A	0.2	1	Load	1	3
		2	Mill	2	20
		3	Drill	3	12
		4	Unload	1	2
B	0.3	1	Load	1	3
		2	Mill	2	15
		3	Drill	3	30
		4	Unload	1	2
C	0.5	1	Load	1	3
		2	Mill	2	14
		3	Drill	3	22
		4	Unload	1	2

*******01/05/17******M**