Student Roll No. _____

GANPAT UNIVERSITY

M. Tech. Sem. II[nd] Mechanical (AMT)

New CBCS Regular Examination May/June-2016

3ME201Computer Integrated Manufacturing

Time: 3 Hrs] [Total Marks: 60

Instructions:-

1. Attempt **all** Questions.
2. Figure to the **right** indicate full marks.
3. Answers to the two section must be written in **separate** drawing papers
4. Assume suitable data if **necessary**.
5. Draw neat sketch wherever essential.
6. Programming codes (G and M Codes) are given at the end of paper

SECTION – I

Q.1 **Write following Answers.**

a) A flexible manufacturing cell consists of three plus a load/unload stations. The load/unload station is stations1 using two servers (material handling workers). Station 2 performs milling operations and consists of two server (two CNC milling machine). Station 3 performs vertical milling operations with three servers (three identical CNC vertical milling machines). Station 4 has two servers that perform drilling (two CNC drill press). The three stations are connected by a part handling system that has two work carriers. The mean transport time is 3.5 min. The FMC produces four parts A, B, C and D, the part mix fractions are process routings 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) average utilization of system. (5)

Part j	Part Mix Pj	Operation k	Description	Station i	Process Time t_{ijk} (min)
A	0.2	1	Load	1	4
		2	Mill	2	15
		3	V.Mill	3	14
		4	Drill	4	13
		5	Unload	1	3
B	0.3	1	Load	1	4
		2	Drill	4	12
		3	Mill	2	16
		4	V.Mill	3	11
		5	Drill	4	17
		6	Unload	1	3
C	0.5	1	Load	1	4
		2	Mill	2	10
		3	Drill	4	9
		4	Unload	1	3
D	0.35	1	Load	1	4
		2	V.Mill	3	18
		3	Drill	4	8
		4	Unload	1	3

b) A flexible machining system is being planned that will consist of four workstations plus a part handling system. Station 1 will be a load/unload station. Station 2 will consist of horizontal machining centers. Station 3 will consist of vertical machining centers. Station 4 will be an inspection station. For the part mix that will be processed by the FMS, the workloads at the four stations are WL1=10 min, WL2=25 min, WL3=15 min, and WL4=12 min. The workload of the part handling system WL5=10 min. The FMS will be operated 19 hr/day, 260 day/yr. Maintenance will be performed during non-production hours, so uptime proportion (availability) is expected to be 94%. Annual production of the system will be 75,000 parts; Determine the number of machines (servers) of each type (station) required to satisfy production requirements. And also determine a) the utilizations of each in the system for the specified production requirements and b) the maximum possible production rate of the system if the bottleneck station were to operate at 100% utilization

OR

Q.1 **Write following Answers.**

a) An overhead trolley conveyor is configured as a continuous closed loop. The delivery loop has a length of 120 m and the return loop=80 m. All parts loaded at the load station are unloaded at the unload station. Each hook on the conveyor can hold one part, and the hooks are separated by 4 m. Conveyor speed=1.25 m/s. Determine: a) maximum number of parts in the conveyor system. b) parts flow rate, and c) maximum loading and unloading times that are compatible with the operation of conveyor system. (5)

b) A flexible manufacturing cell consists of two machining workstations plus and load/unload stations. The load/unload station is stations1. 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 fractions are process routings for the three parts are presented in the table below. The operation frequency $F_{ijk} = 1.0$ for all operations. (5)

Part j	Part Mix Pj	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	Drill	3	14
		3	Mill	2	22
		4	Unload	1	2

Use the extended bottleneck model on above data to compute: Production rate, manufacturing lead time and waiting time for two values: i) N = 2 and ii) N = 4

2 **Write following Answers.**

a) Explain the 10 principles of material handling in brief. (4)

b) Define various terms to check the performance of storage system (3)

trucks are used to transport materials between departments. They move at an average speed 225 ft/min. (loaded) and 350 ft/min. (empty). Load handling time per delivery is 1.5 min. and anticipated traffic factor = 0.9. Assume A = 0.95 and worker efficiency = 110%. Determine the number of trucks required under each of the following assumptions: a) the trucks never travel empty, and b) the truck travel empty a distance equal to their loaded distance.

		To Dept.				
		A	B	C	D	E
From Dept.	A	-	62/500	51/450	45/350	0
	B	0	-	0	22/400	0
	C	0	0	-	0	76/200
	D	0	0	0	-	65/150
	E	0	0	0	0	-

OR

Q.2 **Write following Answers.**

a) Explain initial phase of FMS Planning and implementation issues. (4)

b) Explain the general behavior of the extended bottleneck model. (3)

c) Each aisle of a four-aisle AS/RS is to contain 60 storage compartments in the length direction and 12 compartments vertical. All storage compartments will be the same size to accommodate standard size pallets of dimensions: x = 42 inch. and y = 48 inch. The height of a unit load z = 36 inch. Using the allowances, a = 6 inch., b = 8 inch. and c = 10 inch. Determine: a) how many unit loads can be storage in the AS/RS, and b) the width, length and height of the AS/RS. (4)

Q.3 **Write following Answers.** (9)

a) List communication hardware with very short description for each.

b) Enlist the types of AS/RS and explain its application in manufacturing industries.

c) An automated guided vehicle system is being planned for a warehouse complex. The AGVS will be driverless train system, and each train will consist of the towing vehicle plus four pulled carts. The speed of the train will be 160 ft/min. only the pulled carts carry loads. The averaged loaded travel distance per delivery cycle is 2000 ft and empty travel distance is the same. Anticipated travel factor = 0.95. The load handling time per train per delivery is expected to be 10 min. if the requirements on the AGVS are 25 carts loads/hr. determine the number of trains required. Assume A = 1.0

SECTION – II

Q.4 **Write following Answers.** (12)

a) What is CIM? "CIM is networking of manufacturing facility" discuss whether right or wrong.

b) What is a Flexible Manufacturing system? What renders it so flexible?

c) Modulation and demodulation in communication.

OR

Q.4 **Write following Answers.** (12)

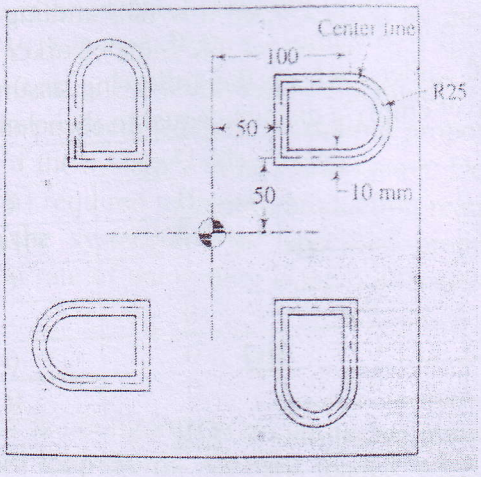
a) Different guidance techniques for AGV. Give detail of how SGV work.

b) Enlist various advantages of automatic storage system. How it helps us to decrease lead time of manufacturing.

c) Communication through RS-232

Q.5 Write following Answers.

a) Write a part program for producing 5 mm deep slots as shown in Fig. using diameter of cutter 10 mm. Plate thickness is 15 mm. Use cutting speed 30 m/min and feed 80 mm/min.



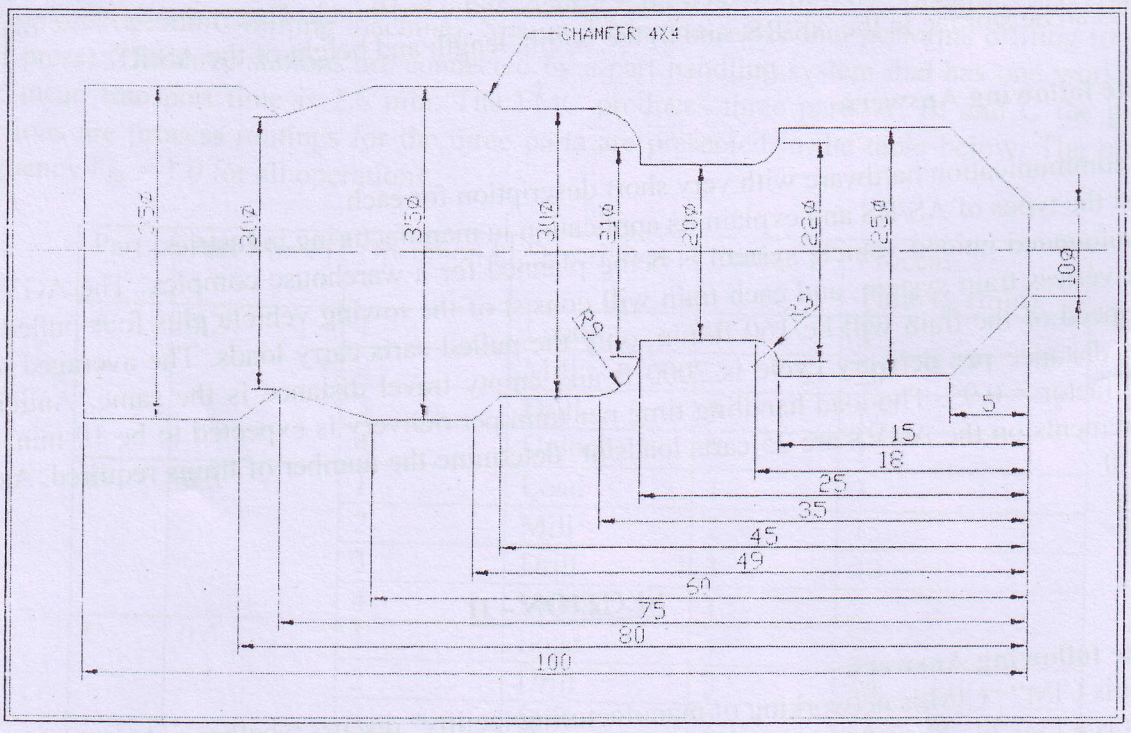
b) What are the importance's of work holding device in CNC machine tool? Explain work holding devices. (4)

OR

Q.5 **Write following Answers.**

a) What is Adaptive control machining system? Explain types of adaptive control machining system. (4)

b) Write the CNC turning programe of the following geometry (5)



.6 **Write following Answers.** (9)

a) Explain the various drilling canned cycle used in CNC machine.

b) What is tool radius and tool length compensation? Explain

c) What is the use of ATC in CNC Machine? Explain

Best of Luck

PREPARATORY FUNCTIONS (G CODES):

G00 – Rapid traverse positioning
G01 – Linear interpolation (federate movement)
G02 – Circular interpolation clockwise
G03 – Circular interpolation counterclockwise
G04 – Dwell
G10 – Tool length offset value
G17 – Specifies X/Y plane
G18 – Specifies X/Z plane
G19 – Specifies Y/Z plane
G20 – Inch data input (on some systems)
G21 – Metric data input (on some systems)
G22 – Salary zone programming
G23 – Cross through safety zone
G27 – Reference point return check
G28 – Return to reference point
G29 – Return from reference point
G30 – Return to second reference point
G40 – Cutter diameter compensation cancel
G41 – Cutter diameter compensation left
G42 – Cutter diameter compensation right
G43 – Tool length compensation positive direction
G44 – Tool length compensation negative direction
G45 – Tool offset increase
G46 – Tool offset decrease
G47 – Tool offset double increase
G48 – Tool offset double decrease
G49 – Tool length compensation cancel
G50 – Scaling off
G51 – Scaling on
G73 – Peak drilling cycle
G74 – Counter tapping cycle
G76 – Fine boring cycle
G80 – Canned cycle cancel
G81 – Drilling cycle
G82 – Counter boring cycle
G83 – Peak drilling cycle
G84 – Tapping cycle
G85 – Boring cycle (feed return to reference level)
G86 – Boring cycle (rapid return to reference level)
G87 – Back boring cycle
G88 – Boring cycle (manual return)
G89 – Boring cycle (dwell before feed return)
G90 – Specifies absolute position
G91 – Specifies incremental positioning
G92 – Program absolute zero point
G98 – Return to initial level
G99 – Return to reference (R) level

MISCELLANEOUS (M) FUNCTIONS:

M00 – Program stop
M01 – Optional stop
M02 – End of program (rewind tape)
M03 – Spindle start clockwise
M04 – Spindle start counterclockwise
M05 – Spindle stop
M06 – Tool change
M08 – Coolant on
M09 – Coolant off
M13 – Spindle on clockwise, coolant on (on some systems)
M14 – Spindle on counterclockwise, coolant on
M17 – Spindle and coolant off (on some systems)
M19 – Spindle orient and stop
M21 – Mirror image X axis
M22 – Mirror image Y axis
M23 – Mirror image off
M30 – End of program, memory reset
M41 – Low range
M42 – High range
M48 – Override cancel off
M49 – Override cancel on
M98 – Jump to subroutine
M99 – Return from subroutine