Exam No: _____

## GANPAT UNIVERSITY
## M.TECH SEM I (MECHANICAL-CAD/CAM)
## REGULAR EXAMINATION JAN-2014
## 3ME115 COMPUTER INTEGRATED MANUFACTURING

TIME – 3 HOURS                                                                TOTAL MARKS- 70

INSTRUCTION:-  1)  All questions are compulsory.
                2)  Figures to the right indicate full marks.
                3)  Make suitable assumptions wherever necessary.
                4)  Programming code (G and M codes) is given at the end of paper.

### SECTION-I

Q-1                                                                                          [12]

(a)  What is flexibility? Discuss different flexibility of FMS.

(b)  A flexible manufacturing system consists of four workstation plus and load/unload station. The load/unload station 1.Station 2 will perform milling operations and consists of three server (one CNC milling machine). Station 3 has two server that performs drilling (one CNC drill press).Station 4 is an inspection station with one server. The stations are connected by a part handling system that has two work carriers and a mean transport time =3.5 min. The FMC produce Four parts A,B,C and D. The part mix fractions are process routings for the four parts are presented in the table below. Note that the operation frequency at the inspection station ($f_{4jk}$) is less than 1.0 to account for the fact that only a fraction of the parts are inspected. Determine: (a) maximum production rate of FMS, (b) corresponding production rate of each part, (c) utilization of each station in the system, and (d) the overall FMS utilization.

| Part j | Part Mix Pj | Operation k | Description | Station i | Process Time $t_{ijk}$(min) | Frequency $f_{ijk}$ |
|--------|-------------|-------------|-------------|-----------|------------------------------|---------------------|
| A | 0.1 | 1 | Load | 1 | 4 | 1.0 |
|   |     | 2 | V.Mill | 2 | 20 | 1.0 |
|   |     | 3 | Drill | 3 | 15 | 1.0 |
|   |     | 4 | Inspect | 4 | 12 | 0.5 |
|   |     | 5 | Unload | 1 | 2 | 1.0 |
| B | 0.2 | 1 | Load | 1 | 4 | 1.0 |
|   |     | 2 | Drill | 3 | 16 | 1.0 |
|   |     | 3 | V.Mill | 2 | 25 | 1.0 |
|   |     | 4 | Drill | 3 | 14 | 1.0 |
|   |     | 5 | Inspect | 4 | 15 | 0.2 |
|   |     | 6 | Unload | 1 | 2 | 1.0 |
| C | 0.5 | 1 | Load | 1 | 4 | 1.0 |
|   |     | 2 | Drill | 3 | 23 | 1.0 |
|   |     | 3 | Inspect | 4 | 8 | 0.5 |
|   |     | 4 | Unload | 1 | 2 | 1.0 |
| D | 0.35 | 1 | Load | 1 | 4 | 1.0 |
|   |      | 2 | V.Mill | 2 | 30 | 1.0 |
|   |      | 3 | Inspect | 4 | 12 | 0.333 |
|   |      | 4 | Unload | 1 | 2 | 1.0 |

OR

Q-1                                                                                          [12]

(a)  Explain in brief, the common techniques used for repetitive programming with proper illustrations. And How axis are designated in CNC Turning and Machining Centre? Explain with sketch.

(b) Four machines will constitute a GT cell. The from–to data for the machine are as follows.

| | FROM | | | |
|---|---|---|---|---|
| TO | **1** | **2** | **3** | **4** |
| **1** | 0 | 5 | 0 | 25 |
| **2** | 30 | 0 | 0 | 15 |
| **3** | 10 | 40 | 0 | 0 |
| **4** | 10 | 0 | 0 | 0 |

(*i*) Determine the sequence of machine according to/from ratio
(*ii*) Construct a flow diagram
(*iii*) Where do the parts enter cell and exit the cell. 50 parts enter at machine 3, 20 parts after machine 1 leaves and 30 parts after machine 4 leaves.

**Q-2**

(a) A programme for part given Figure (A). Material is 24mm thick.                    [11]
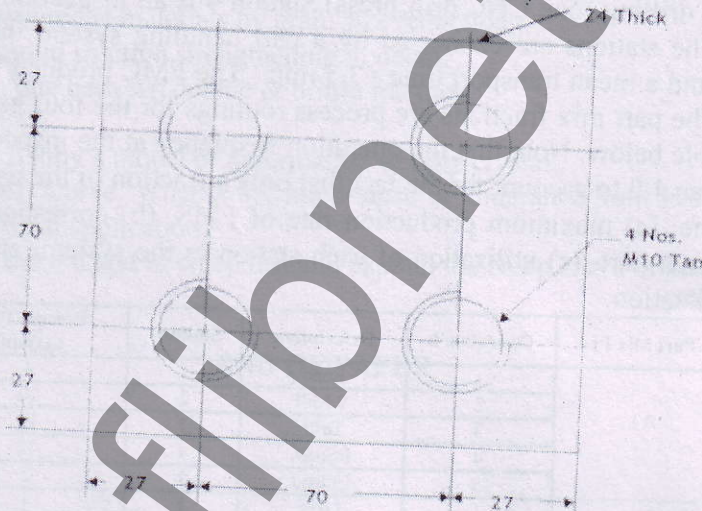


NOTE : All dimensions are in mm
Figure(A)

(b) An AGVS has an average travel distance per delivery = 500 m and an average empty travel distance = 300m. The system must make a total of 75 deliveries per hour. The load and unload times are both 0.5 min and the speed of the vehicles = 150 m/min. The traffic factor for the system = 0.85. Determine the average total time per delivery, the handling system efficiency and the resulting average number of deliveries per hour for a vehicle. How many vehicles are needed to satisfy the indicated deliveries per hour?

**Q-2**                                         **OR**

(a) Write a program of CNC Turning Centre for following component shown in Figure (B): Raw Material Size : 30Ø mm X 80 mm Long                    [11]
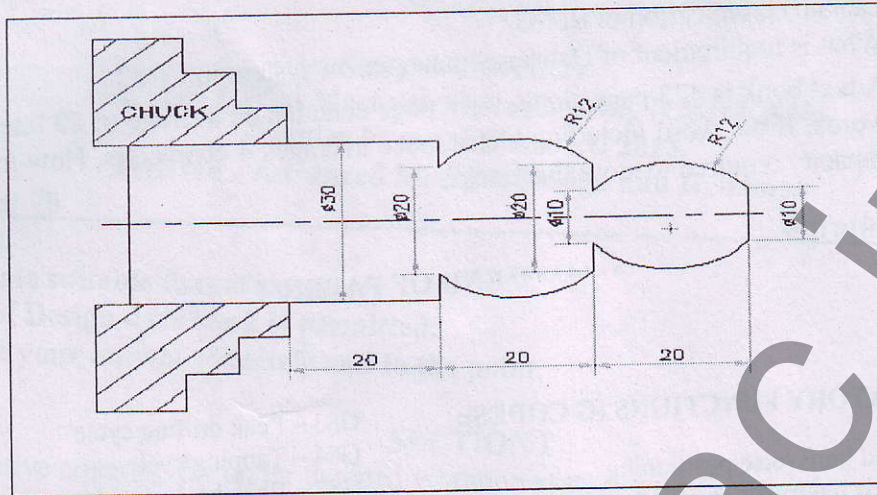
Figure (B)

(b) What is material handling? Explain about equipments used for material handling.

**Q-3**    **Attempt Any Three.**      [12]

(a) Explain OPITZ and MICLASS coding system of GT to form part families.

(b) Define following terms of AGV
1) Guide path   2) Routing   3) Scheduling   4) Idle vehicle

(c) What is FMS? Explain layout of FMS. Which layout is best for automobile industry?

(d) Explain the Concept of GT. what are the attributes to form part family?

## SECTION-II

**Q-4**      [12]

(a) Explain characteristics of computer simulation.

(b) What do you understood in CIM ? Which type of Activities of CIM?

(c) Explain Open System Interconnection (OSI) in Brief and How it is differ from TCP/IP.

**OR**

**Q-4**      [12]

(a) Explain the nature and role of the elements of CIM system in brief.

(b) Explain various type of communication in CIM.

(c) What do you mean by modulation? Explain types of modulation along with example.

**Q-5**      [11]

(a) Explain communication matrix.

(b) What is Network and Networking? Explain most usable type of network.

**OR**

**Q-5**      [11]

(a) Enlist Machine Control Unit in NC system.

(b) What do you understood in CIM ? Which type of Activities of CIM?

**Q-6**    **Attempt Any Three**      [12]

(a) What is DNC? give its advantages and disadvantages.

**(b)** Explain classification of DBMS.

**(c)** What is requirement of Database management system in CIM?

**(d)** A text book is 423 pages long, Each page contains on average of 20 line, each line 9 words, If the word including blank space averages 4 characters, How much storage capacity required to store this book?.

********END OF PAPER*******

## PREPARATORY FUNCTIONS (G CODES):

G00 – Rapid transverse 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
G87 – Back boring cycle
G88 – Boring cycle (manual return)
G89 – Boring cycle (dwell before feed return)
G90 – Specifies absolute positioning
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