CMR INSTITUTE OF TECHNOLOGY

USN | | | | | | | | | | |

CMR

Internal Assesment Test - II

Sub:	COMPUTER INTEGRATED MANUFACTURING							Code:	10ME 061
Date:	08/05/2017	Duration:	90 mins	Max Marks:	50	Sem:	VI	Branch:	Mechanical

Answer ANY 5 questions

		Marks	OBE	
			CO	RBT
1	With a neat diagram, explain Generative and Retrieval CAPP systems	[10]	CO2	L1
2	a) What is MRP? Illustrate the MRP process with an example.	[06]	CO2	L1
	b) What are the inputs and outputs of MRP process	[04]	CO2	L2
3	Explain with neat sketches, different types of end effectors and sensors used in robots.	[10]	CO5	L2
4	Explain the five different robotics configurations with diagrams	[10]	CO5	L2
5	Using Killbridge and westers method, solve the following Line balancing problem and determine the minimum no. of workstations, balancing delay and the line balancing efficiency. The cycle time is 10 min.	[10]	CO2	L3

Task	1	2	3	4	5	6	7	8	9	10	11	12
Time	2	4	7	1	3	1.1	3.2	6	2.7	3.8	5	1.2
Preceding Task	-	-	1	1,2	2	3	3	3, 4	6,7 ,8	5,8	9, 10	11

08/05/2017

Computer Integrated Manufacturing

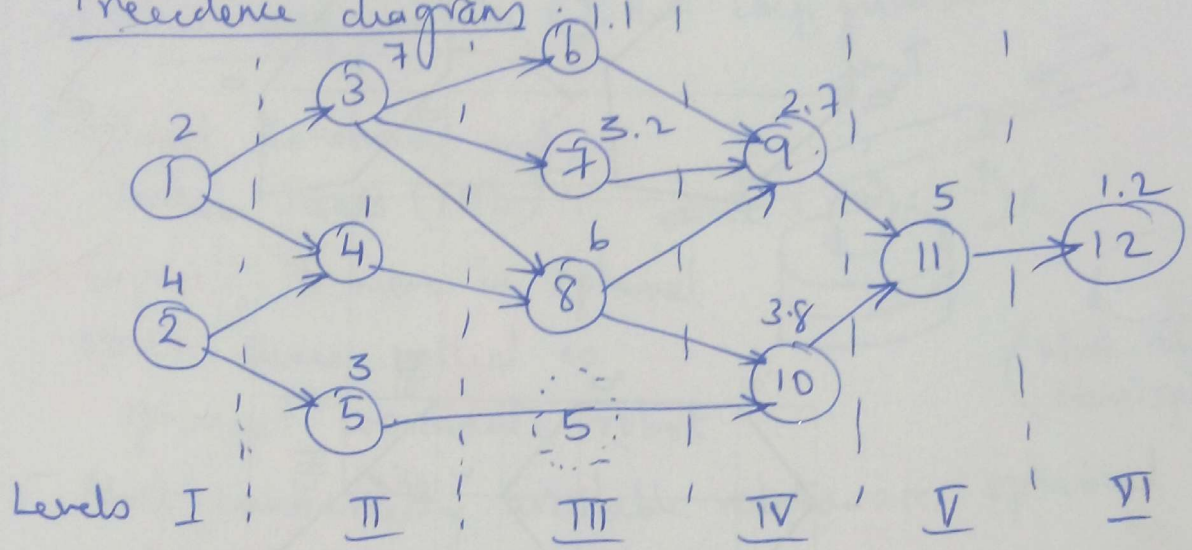
Internal Test II (Solution).

5) Cycle time = 10 mins.

Total time = 40 mins.

Minimum no. of work station = $\frac{40}{10}$ = 4 workstations

Precedence diagram:



Assignment.

Work station.	Work Element	Activity time	Station time	Station Delay	Precedence availability
1	2	4			1,2
	2+1	6			1,5
	2+1+5	9			3,4,5
	2+1+5+4	10	10	0	3,4
2	3	7			3,
	3+6	1.1	8.1	1.9	6,7,8
3	8	6			7,8.
	8+7	3.2	9.2	0.8	7,10
4	10	3.8			9,10
	10+9	2.7	6.5	3.5	9
5	11	5			11
	12	1.2	6.2	3.8	12

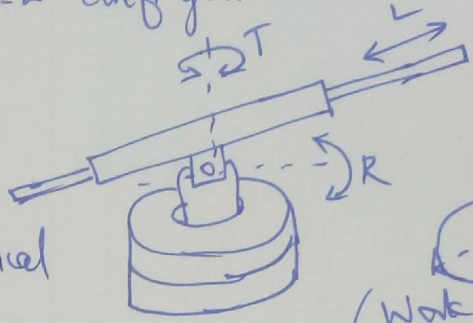
b) Line balancing efficiency $E_b = \frac{\sum T_{WC}}{n \times T_C}$

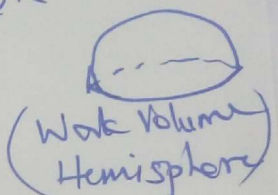
$E_b = \frac{40}{5 \times 10} = 80\%$

c) Balancing delay $= 1 - E_b = 20\%$.

Qn (4) Robotics Configurations :-

a) Polar configuration (T-R-L Configuration)

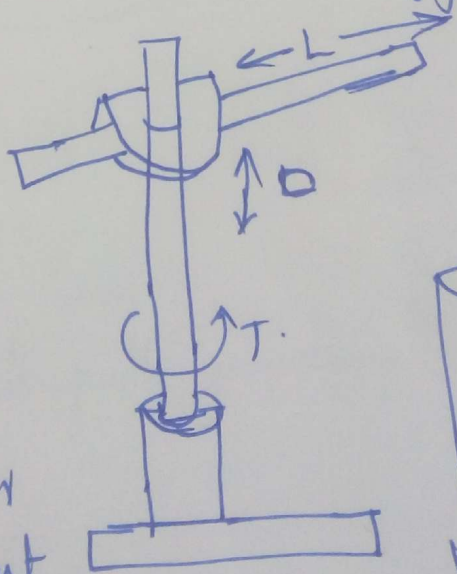


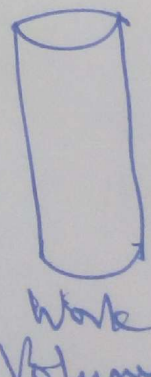


- Twist, Rotational and Linear Joints (TRL).
- Capacity to move in spherical space. Hence called as spherical coordinate robot.
- Most commercially available robots are spherical in configuration.
- Robotic arm moves in a spherical shape workspace

Eg:- UNIMATE 2000 series, MAKER 110.

b) Cylindrical Cordinate Configuration (TLO Configuration)



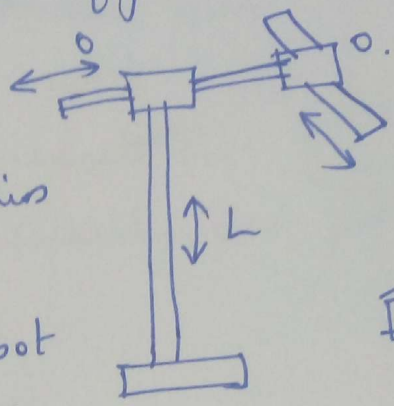


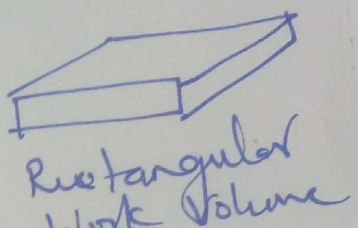
- Consists of a vertical column and a slide which can be moved up and down.
- Workspace obtained can be treated similar to a Cylinder.
- One Twisted joint (T), One linear joint (L) and one Orthogonal joint (O).
- Rigid structure with high load carrying

capability.
- Very high repeatability with least error.
Eg:- MIA - developed by GM.

ⓒ. Cartesian Coordinate Configuration (L-O-O).

- 3 Lr slides in X, Y & Z directions.
- Capable of operating within a rectangular work area.
- Also, called as XYZ Robot or Rectilinear Robot or Box configurations.
- Eg: IBM RS-1.

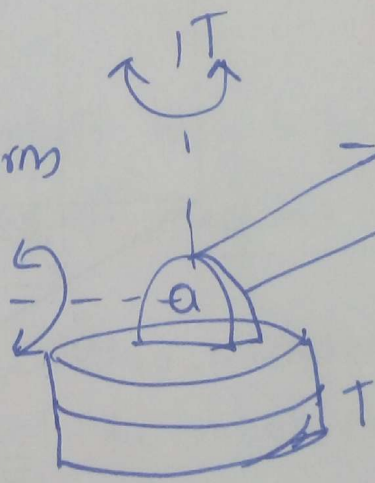


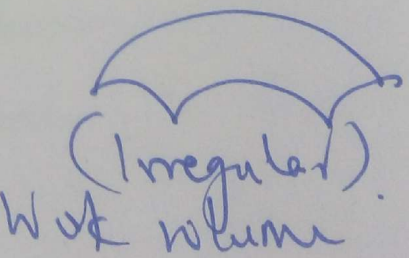


ⓓ. Jointed Arm Configuration (TRR) Configurations

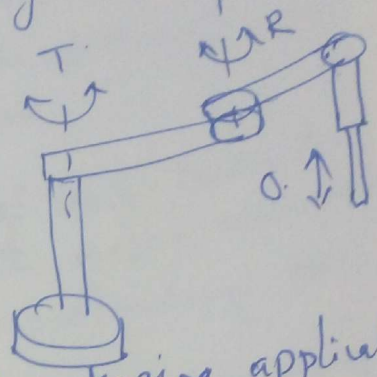
- Similar to human arms
- corresponds to human forearm and upper arm.
- 2 rotary joints and 1 twist joint. No linear joints - (T-R-R).
- A wrist is attached to the end of the arm.
- It has higher reach from the base.
- They are useful in continuous path generations like spray painting and welding.

Eg: SCARA, Milacron. (T3).





e) SCARA – (Selective Compliant Assembly Robotic Arm).



- Ideal for high speed assembly, packaging, and material handling.
- SCARA behave like a human arm.
- Has limited motion at wrist.
- It can rotate but it cannot tilt
- Eg:- Pick and Place, assembly, and packaging applicatin

Q. (7). Robotic Programming :-

It is defined as the path followed by the robot manipulator along with its peripherals to perform a specific work.

Mainly 4 types.

a) Manual Method :-
- Used in small robots only for simple applicatins
- there is setting up of machines than actual programming
- Done by limit switches, mechanical stops, Cams or relay to control the robot motions.
- Applications – low technology robots with short work cycles.

Eg:- Pick and place robots

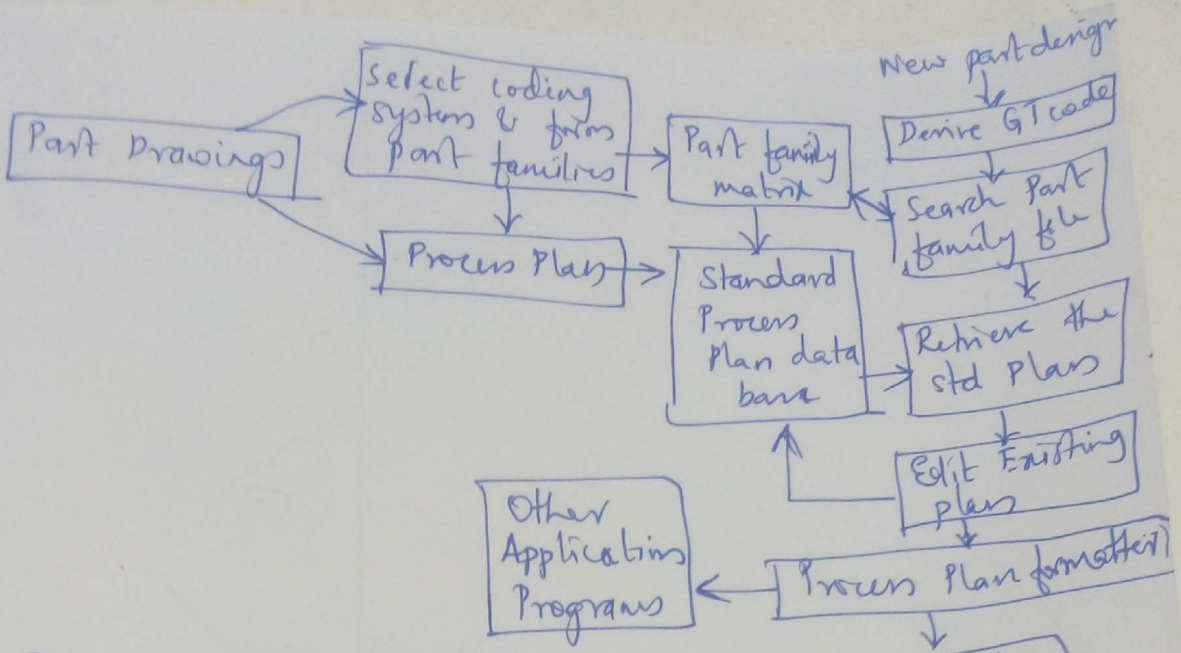
b) Walk around Method or Manual Lead through Method
- Employed for with continuous path controls.
- Operator manually move the arms of robot through the motion sequence
- Each movement is recorded in the memory and subsequently playback during production.

- Speed of movements can be controlled during playback
- Eg:- Spray welding painting and arc welding.

(3) Lead Through Method: or Powered Lead through Method or On line Programming Method.
- Used for Point to Point Control.
- Hand held teach Control box called Teach Pendant. used to drive the robot through the motion sequence
- Each movement is recorded in control memory for future playback.
- Easy and simple method; No special programming skills are required.
- Cannot be used on large & heavy robots and perform complex movements.
- It Requires lot of memory to store the data.

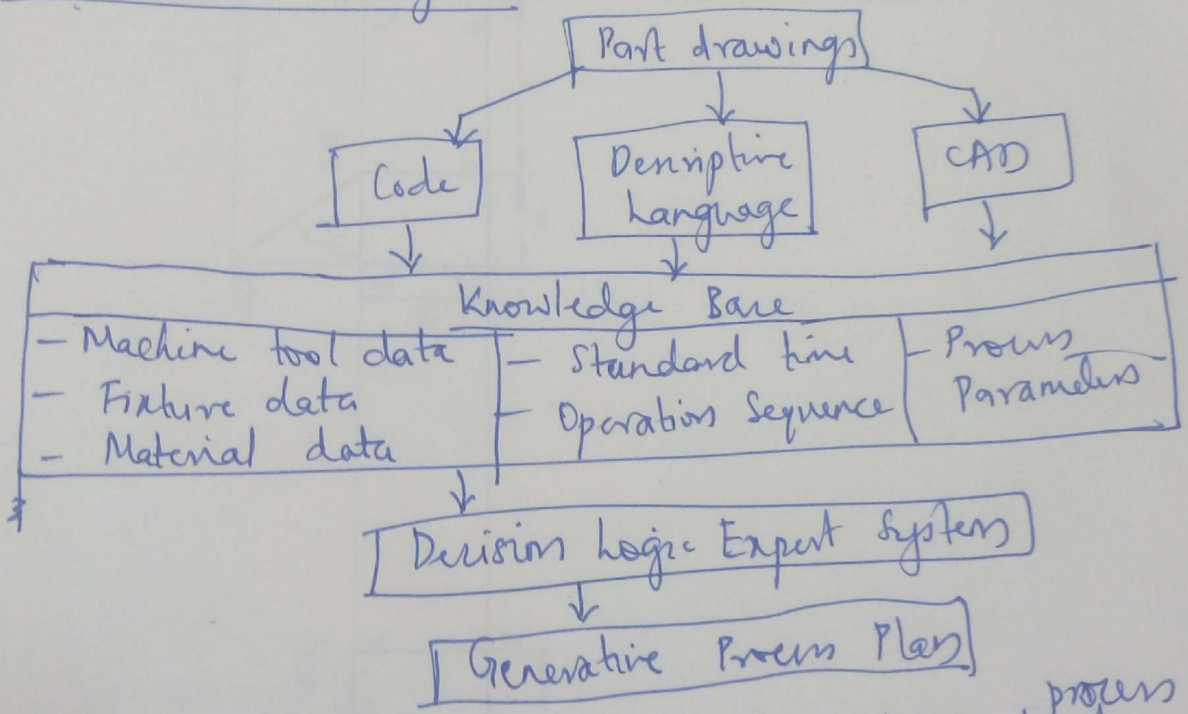
(4) Offline Programming:-
- Programming is not accomplished on the shop-floor.
- Done on a computer, and after the program has been prepared, it is entered to the robot memory.
- Advantage - No loss of production time.
- Can be integrated with various CAD/CAM systems.

(1) Retrieval CAPP:-
- Uses a GT code to select a standard process plans from the existing process plans developed for each part family.
- Implemented with GT coding system. (GTroup Technology principles and part classifications & coding).
- A significant amount of information has to be compiled and entered into CAPP system.
- ~~Once the document~~



⇒ Printed in the form of "Route sheet".

(b) Generative CAPP systems :-



- Do not require user assistance from standard process plans.
- It accept the real time geometric and manufacturing data of the part.
- Uses computerised searches & decision logic to develop the part process plan automatically.
- Automatically generates a unique plan for a part.