

Internal Assessment Test 1 – September – 2017

USN

Subject:

Date: **Duration:** 90mins **Max Marks:** 50 **Sem:**

Code:

Section:

Note: Answer any 5 questions (5 x 10 = 50)

		OBE	
		CO	RBT
1.	Explain the different types of Automation. Also Write down the disadvantages of Automation.	CO1	L2
2.	Define FMS and explain the material handling system of FMS.	CO1	L2
3.	Explain the components of a manufacturing system.	CO1	L2
4.a)	Write short notes on FMCs and FMSs.	CO1	L1
b)	List out the functions of computer control system in FMS.		

5. With a neat sketch, describe the various FMS layouts.
- 6.a) Define Robot and write Asimov's laws of Robotics.
b) Write short notes on history of Robotics
7. Explain the various Robot configurations with a neat sketch.

CO1	L2
CO1	L1
CO1	L2

Internal Assessment Test - I

Course: Automation of Robotics

Academic year: 2017-18

Code: ISME 562

Sem: V

Branch: ECE

SOLUTIONS KEY

1. Different types of automation

i) Fixed Automation

- Sequence of processing / Assembly operation is fixed by the equipment configuration
- High initial investment
- High production rates.
- Inflexibility of the equipment to accommodate product variety is one of the disadvantages.

ii) Programmable automation

- Production equipment is designed with the capability to change the sequence of operations to accommodate different product configurations.
- High investment
- Low production rates compared to fixed automation.

(iii) Flexible automation

- Extension of programmable automation
- High investment
- Continuous production.

Disadvantages of Automation

- * Larger initial investment
- * Increase in unemployment
- * Lower skill levels of worker

2. FMS - Definition

A flexible manufacturing system is a highly automated GT cell consisting of a group of processing workstations, interconnected by an automated material handling and storage system controlled by a distributed computer system.

Material handling system of FMS

Material handling equipment of FMS can be broadly classified as

- * Primary material handling systems
- * Secondary material handling systems.

Primary material handling system establishes the basic layout of FMS and is responsible for moving parts b/w workstations in the system.

Secondary material handling system is used to transfer the work from primary material handling system to machine tool or other processing stations.

Q. NO	Solution	Marks.
3.	<p><u>Components of Manufacturing system.</u></p> <ul style="list-style-type: none"> → Production machine, Tools, fixtures etc → Material handling system. → Computer control system. → Human workers. 	
	<p>(i) <u>Production machines.</u></p> <p>* can be manually operated, semi-automated or fully automated</p>	23
	<p>(ii) <u>Material handling system.</u></p> <ul style="list-style-type: none"> (a) Loading and unloading work units (b) Positioning work units at each station. (c) Transporting work units between stations (d) Temporary storage function. <p>Achieved using Palletizers, Totebins, Jigs, fixtures, Chucks, etc.</p>	23
	<p>(iii) <u>Computer control system.</u></p> <ul style="list-style-type: none"> (a) Communicate instructions to workers (b) Material handling system control. (c) Download part programs. (d) Failure diagnostics. 	23
	<p>(iv) <u>Human workers</u> Overall management of system.</p>	23

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4a)

Fmc

- Flexible Manufacturing cells.
- It consists of 2 or 3 processing workstations and a part handling system.

Fms

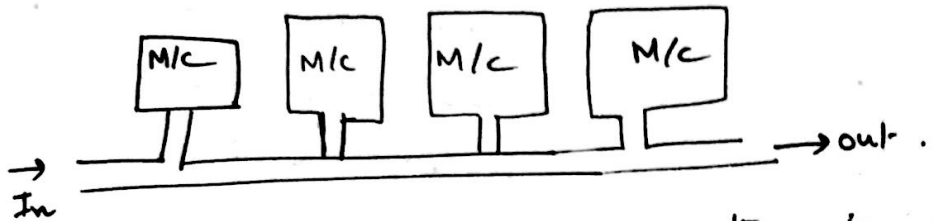
- Flexible manufacturing system.
- A highly automated GT machine cell consisting of a group of processing workstations, interconnected by an automated material handling and storage system controlled by a distributed computer system.

4b) Functions of computer control system of Fms

- (i) Workstation control
- (ii) Production control
- (iii) Traffic control
- (iv) Shuttle control.
- (v) Workpiece monitoring
- (vi) Tool control.
- (vii) Performance monitoring & Reporting.
- (viii) Diagnostics.

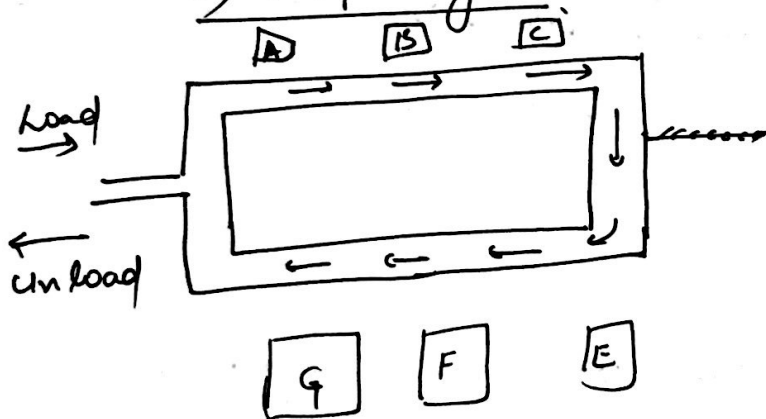
5) Fms layouts.

(i) In line layout



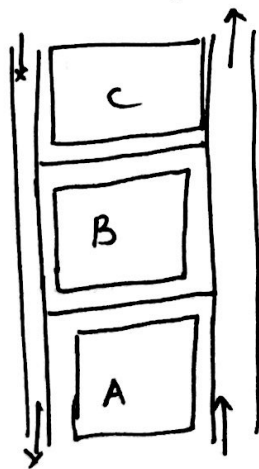
In in-line layout, there is a single way in which material has to enter from outside and should exit from other end.

(ii) Loop layout



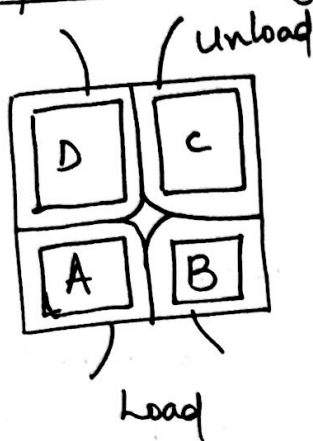
In this kind of layout, flexibility can be increased to some extent but not effective level.

(iii) Ladder layout



In this layout, parts are free to move in any direction and the number of parts available are more than in this layout.

(iv) Open field layout



→ Parts are free to move.

→ Space requirements is more of hence many machines can be incorporated.

(v) Robot centered layout

At the centre, a robot will be placed which performs certain tasks like loading & unloading various parts in the machines.

b.a Robot - Definition

"An industrial robot is a reprogrammable multifunctional manipulator designed to move materials, tools or special devices through variable programmed motions for the performance of variety of tasks."

Asimov's laws of robotics

(1) A robot may not injure a human being or through machine allow a human to be harmed."

(2) A robot must obey orders given by humans except that when conflicts with first law.

(3) A robot must protect its own existence except that conflicts with 1st and 2nd laws.

Qno

Solution

Marks.

6b) History of Robotics

1700 → J. de-Vaucanson built several human sized mechanical dolls that played music

1952 → Prototype NC machine demonstrated at MIT, Boston.

1960 → First unimate robot introduced

1961 → Unimate robot installed at Ford motor company.

1978 → PUMA robot introduced for assembly.

1979 → Development of SCARA type robot for assembly.

(5)

7.

Robot Configurations

there are 4 basic types of

Configurations

(i) Polar configuration

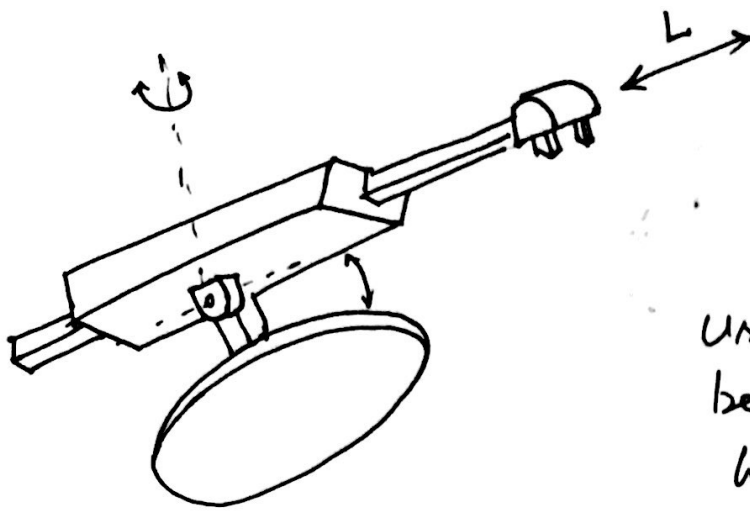
(ii) Cylindrical configuration

(iii) Cartesian configuration

(iv) Jointed-arm configuration.

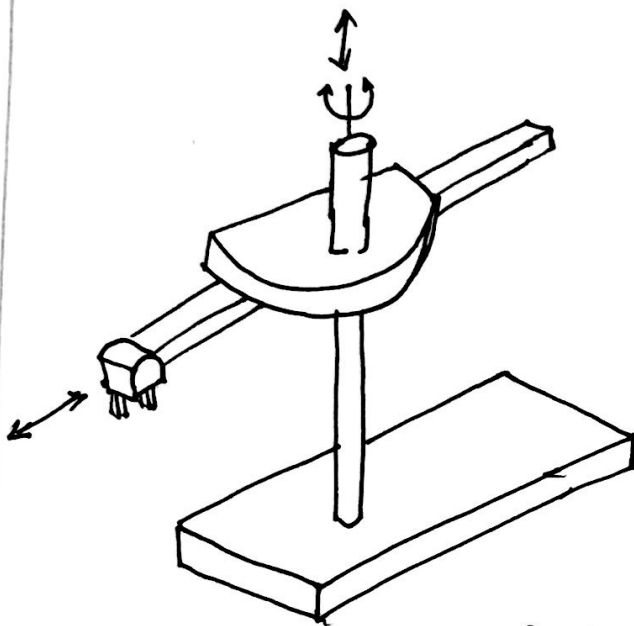
with relevant diagrams

10.

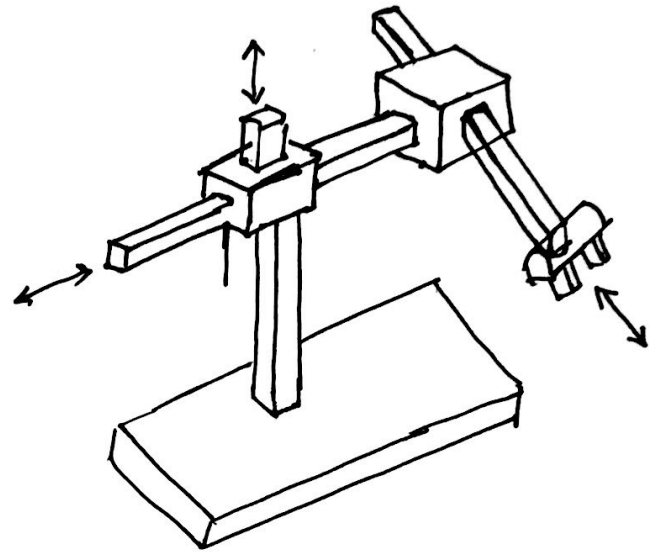


Polar configuration

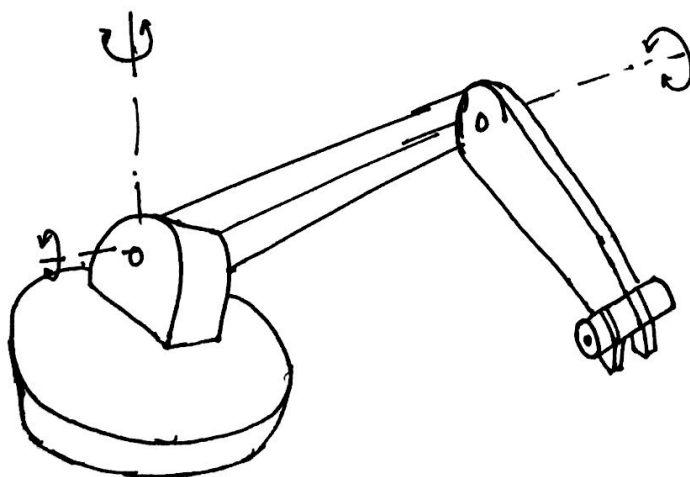
Uses a telescopic arm that can be lowered/raised about a horizontal pivot.



b) Cylindrical configuration



c) Cartesian configuration



d) Jointed arm configuration