SYED AMMAL ENGINEERING COLLEGE

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Department of Mechanical Engineering

Sem: 7 **ME6702- Mechatronics** **Class: IV year Mechanical**

Two Marks and Answers

Book Reference:

1. Dr.P.Marimuthu, G.Prabhakar and Dr.S.Selvaperumal, "**Mechatronics**", Anuradha Publications 2016.

Unit 1

Chapter 1:

1. Define Mechatronics

Mechatronics is the synergistic integration of sensors, actuators, signal conditioning, power electronics, decision and control algorithms, and computer hardware and software to manage complexity, uncertainty, and communication in engineered systems.

2. What is mechatronic approach?

The integration across the traditional boundaries of mechanical engineering, electrical engineering, electronics and control engineering has to occur at the earliest stages of the design process if cheaper, more reliable; more flexible systems are to be developed. Mechatronics has to involve a concurrent approach to these disciplines rather than a sequential approach of developing, say, a mechanical system, then designing the electrical part and the microprocessor part. Thus Mechatronics is a design philosophy, an integrating approach to engineering.

However, the basis of the Mechatronics approach is considered to lie in the concurrent inclusion of the disciplines of mechanical engineering, electronics, computer technology and control engineering in the approach to design.

3. Mention the functions of a mechatronic system.

The functions are

1. Distribution of mechanical and electronic functions
   - Decentralized electrical drives microcomputer based control.
   - Linearization of nonlinear mechanism characteristics using feedback loop
   - Operator adaptation using programmable characteristics
2. Operating properties-Process of system behaviour adaptation using feedback control systems.
   - Increased accuracy due to feedback control systems
   - Adaptive friction compensation.
   - Model based and adaptive control
3. New functions-these functions would not be possible without using embedded computers.

- Control of non-measurable or hard-to-measure variables
- Advanced supervision and fault diagnosis.
- Fault tolerant systems with hardware or analytical redundancy.
- Remote services for supervision, service etc
- Flexible adaptation for changing the boundary conditions.

4. List the Domains involved in Mechatronics.
   They are: Mechanical, Electrical, Electronics, Computer and control systems

5. What are the human efforts related to mechatronics?
   - Setting the goal (a purely mental activity).
   - Sensing the environment through the five sensory organs—eyes, ears, skin, tongue, and nose.
   - Communicating the sensory signals to the central neural processor called the brain.
   - Fusing the signals to recognize patterns of interest and output the command signals to human limbs.
   - Performing the physical task using limbs (actuators).

Chapter 2:

1. What is potentiometer?

Basically a resistance potentiometer, or simply a POT, (a resistive potentiometer used for the purposes of voltage division is called a POT) consists of a resistive element provided with a sliding contact. The POT is a passive transducer.

2. What are the advantages and disadvantages of potentiometer?

Advantages :
- Inexpensive
- Useful for measurement of large amplitudes
- Efficiency is very high
- Frequency response of wire wound potentiometers is limited

Disadvantages :
- Require a large force to move

3. What is resistance thermometers?

A resistance thermometer consists of a resistive element which is exposed to the temperature to be measured. If the conductors or metals are used to measure the temperature, they are known as resistance thermometers and if semiconductors are used then they known as thermistors

4.What are the applications of thermistors?
- Measurement of power at high frequencies
- Measurement of thermal conductivity
- Measurement of level, flow and pressure of liquids
- Measurement of composition of gases
- Vacuum measurements
- Providing time delay.

5. Mention the applications of strain gauge.

- Used to measure pressure
- Used to measure torque
- Used to measure acceleration
- Used to measure force

6. What is LVDT?

The Linear Variable Differential Transformer (LVDT) is the most common mutual inductance element. This can be considered to be a versatile transducer element for most of the electromechanical measuring systems with regards to resolution, hysteresis, dynamic response, temperature characteristics, linearity and life.

7. What are the advantages and disadvantages of LVDT?

Advantages :

- High range
- Friction and electrical Isolation
- Immunity from external effects
- High input and high sensitivity
- Ruggedness
- Low hysteresis
- Low power consumption

Disadvantages :

- Relatively large displacements are required for appreciable differential output
- They are sensitive to stray magnetic fields but shielding is possible
- Many a times, the transducer performance is affected by vibrations.
- The receiving instrument must be selected to operate on a.c
- The dynamic response is limited
- Temperature affects the performance of the transducer.

8. What are the applications of LVDT?

- Displacement measurement and LVDT Gage heads
- LVDT pneumatic servo follower
- LVDT Load cells
- LVDT Pressure Transducer

9. What are the different transfer characteristics of the transducer?

- Transfer function
- Error
  - Scale error
  - Zero error
  - Sensitivity error
  - Non- conformity
  - Hysteresis
- Transducer response

10. What is strain?

It is a ratio of changing length to original length.

11. Define sensitivity

Sensitivity is defines as the electrical output per unit change in the physical parameter. High sensitivity is generally desirable for a transducer.

12. State the advantage & disadvantage of capacity type proximity sensor

The advantages of capacitive proximity sensors include:

1.Detects metal and nonmetal, liquids and solids
2.Can "see through" certain materials (product boxes)
3.Solid-state, long life
4.Many mounting configurations

The disadvantages of capacitive proximity sensors include:

1.Short (1 inch or less) sensing distance varies widely according to material being sensed
2.Very sensitive to environmental factors — humidity in coastal/water climates can affect sensing output
3.Not at all selective for its target — control of what comes close to the sensor is essential

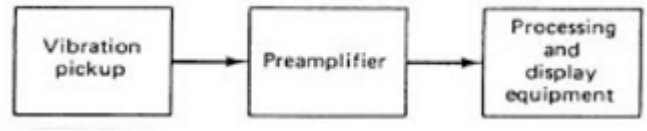
13. List any four types of sensors.

They are: Position sensor, Velocity sensor, Proximity sensors and Light Sensors

14.What is the basic principle in thermocouples?

A thermocouple is a device made by two different wires joined at one end, called **junction end** or **measuring end**. The two wires are called **thermo elements** or legs of the thermocouple: the two thermo elements are distinguished as positive and negative ones. The other end of the thermocouple is called **tail end** or **reference end**. The junction end is immersed in the environment whose temperature T_2 has to be measured, which can be for instance the temperature of a furnace at about 500°C, while the tail end is held at a different temperature T_1, e.g. at ambient temperature. The working principle of thermocouple is based on three effects, discovered by See back, Peltier and Thomson.

15. Define measurement system with a block diagram.



The Basic Measurement system is a set of different blocks which can be used to measure any quantity or to specify anything which can be measured. The block diagram of a simple measurement system is given above. A Basic Measurement system consists of following main blocks:

- Transducer or Primary Sensing Element
- Signal Conditioner
- Output Device

16. Difference between absolute encoder and incremental encoder.

Incremental rotary encoder outputs the pulse corresponding to the rotation angle only while rotating, and is the counting measurement method that adds up the pulse from the measurement beginning point.

Absolute rotary encoder outputs the signal of position corresponding to the rotation angle by code. The Absolute position from the starting point is measured by the output code data. The position is memorized though the power supply is cut off.

Unit-2

Chapter 3:

1. Define Mnemonics.
   The short hand form of describing the instructions is called mnemonics. The mnemonics are given by the manufacturers of microprocessors and programmable logic devices.
2. List the various machine cycles of 8085.
   The various machine cycles are Opcode fetch cycle, memory read cycle, memory write cycle, IO read cycle, IO write cycle, Interrupt acknowledge cycle and bus idle cycle.
3. What is the need for a timing diagram?
   The timing diagram provides information regarding the status of various signals, when a machine cycle is executed. The knowledge of timing diagram is essential for a system designer, to select matched peripheral devices like memories, latches, ports, etc., to form a microprocessor system.
4. How many instructions are available in the 8085 instruction set?
   The 8085 instruction set consists of 74 basic instructions and 246 total instructions.
5. What is addressing?
   The method of specifying the data to be operated by the instruction is called addressing.
6. What are the addressing modes available in 8085?
   The 8085 has five different addressing modes. They are
   1. Immediate addressing.
   2. Register addressing.
   3. Direct addressing.
   4. Indirect addressing.
   5. Implicit addressing
7. What is PSW?
   PSW-Program Status word. The flag register and accumulator together is called PSW. Flag register is a low order register. The accumulator is a high order register.
8. What is the difference between CALL and JUMP instruction in 8085?
   In CALL instruction, the address of the next instruction is pushed to the stack before transferring the program control to the call address. But in JUMP instruction, the address of the next instruction is not saved.
9. What is ALE?
   ALE (Output)- Address Latch Enable: It occurs during the first clock cycle of a machine state and enables the address to get latched into the on chip latch of peripherals. The falling edge of ALE is set to guarantee setup and hold times for the address information. ALE can also be used to strobe the status information.
10. Define PC
    PC-Program Counter. This 16-bit register deals with sequencing the execution of instructions. This register is a memory pointer. Memory locations have 16-bit addresses, and that is why this is a16-bit register. The microprocessor uses this register to sequence the execution of the instructions. The function of the program counter is to point to the memory address from which

the next byte is to be fetched. When a byte (machine code) is being fetched, the program counter is incremented by one to point to the next memory location

11. List the 8085 instructions that affect only carry flag.

    They are: CMC, DAD rp, RAL, RAR, RLC, RRC and STC

12. What is a flag?
    The data conditions, after arithmetic or logical operations, are indicated by setting or resetting the flip flops called flags.
13. Explain the function of ALU and IO/M signals in the 8085 architecture?

    The ALU signal goes high at the beginning of each machine cycle indicating the availability of the address on the address bus, and the signal is used to latch the low-order address bus. The IO/M signal is a status signal indicating whether the machine cycle is I/O or memory operation. The IO/M signal is combined with the RD and WR control signals to generate IOR, IOW, MEMW, MEMR.
14. Write down the control and status signals of 8085 microprocessor?
    Two control signals and three status signals
    Control signals: RD and WR
    Status signals: IO/M, S1, S2
15. Give the bit positions reserved for the flags in 8085 microprocessor?

D7	D6	D5	D4	D3	D2	D1	D0
S	Z		AC		P		CY

16. Give the functional categories of 8085 microprocessor instructions?

    1. Data transfer operations
    2. Arithmetic operations
    3. Logical operations
    4. Branching operations
    5. Machine control operations

17. Define Microprocessor?
    Microprocessor is a multipurpose, programmable, clock-driven, register based electronic device that reads binary instructions from a storage device called memory, accepts binary data as input and processes data according to those instructions, and provides as output.
18. What are the limitations of 8085 MPU?
    (i) The lower order address bus of the 8085 microprocessor is multiplexed (time shared) with the data bus. The buses need to be demultiplexed.
    (ii) Appropriate control signals need to be generated to interface memory and I/O with the 8085.
19. Why the microprocessor is viewed as a programmable Device?
    Microprocessor is programmable because it can be instructed to perform given tasks within its capability. Microprocessor is designed to understand and execute many binary instructions.

20. What is microcontroller?

A single IC which contains the microprocessor with integrated peripherals like memory, serial ports, parallel ports, timer/counter, interrupt controller, data acquisition interfaces like ADC, DAC is called Microcontroller.

CPU	ROM	RAM
Timers	I/O Ports	Serial Port

Internal blocks of Microcontroller

21. Compare Microprocessor and Microcontroller.

S.No	Microprocessor	Microcontroller
1	The functional blocks of a microprocessor are CPU which contains ALU, few registers, timing and control unit.	The functional blocks of microcontroller includes a CPU, Timers, Parallel I/O ports, Serial I/O port, and internal RAM and ROM memory. Some microcontrollers have even ADC and/or DAC on-chip.
2	µP operates on byte/word data. Hence, it has LESS bit manipulation instructions.	µC operates on bit/byte data. Hence, it has MORE bit manipulation instructions.
3	A µP based system requires large no. of peripherals and hence, its PCB will be LARGE.	A µC based system can be formed without using additional peripheral ICs. Hence, its PCB will be SMALL.
4	A µP based system is used for General purpose computing and Data processing applications.	A µC based system is used for application specific dedicated systems. Eg. Washing machines, Mobile phones, Microwave oven, Elevators, etc.
5	It involves movement of code & data between µP and external memory. Hence MORE instructions are made available for data transfer with external memory.	It involves movement of code & data between internal memory & CPU inside µC. Hence LESS instructions are available for data transfer with external memory.

Unit-3

Chapter 5:

1. What is a programmable peripheral device?

If the functions performed by a peripheral device can be altered or changed by a program instruction then the peripheral device is called programmable device. Usually the programmable devices will have control registers. The device can be programmed by sending control word in the prescribed format to the control register.

2. What are the internal devices of 8255?

The internal devices of 8255 are port-A, port-B and port-C.

The ports can be programmed for either input or output function in different operating modes.

3. Write down the output control signals used in 8255A PPI?

- OBF → Output Buffer Full
- ACK → Acknowledgement
- INTR → Interrupt request
- INTE → Interrupt Enable

4. What is the purpose of 8255 PPI?

The 8255A is widely used, programmable, parallel I/O device. It can be programmed to transfer data under various conditions, from simple I/O to interrupt I/O.

5. What are the operating modes of port -A 8255?

The port-A of 8255 can be programmed to work in anyone of the following operating modes as input or output port.

Mode-0: Simple 1/0 port. Mode-l: Handshake 1/0 port Mode-2 : Bidirectional 1/0 port

6.What are the functions performed by port-C of8255?

1. The port-C pins are used for handshake signals.

2. Port-C can be used as an 8-bit parallel 1/0 port in mode-0.

3. It can be used as two numbers of 4-bit parallel port in mode-0.

4. The individual pins of port-C can be set or reset for various control applications.

7. What is debouncing ?

When a key is, pressed it bounces for a short time. If a key code is generated immediately after sensing a key actuation, then the processor will generate the same keycode a number of times.(A key typically bounces for 10 to 20 ms). Hence the processor has to wait for the key bounces to settle before reading the keycode. This process is called keyboard debouncing.

8. DefineA/D and D/A converters?

D/A converters transform a digital signal to an equivalent analog signal, and A/D converters transform an analog signal to an equivalent digital signal.

9. What is resolution?

Resolution of a converter determines the degree of accuracy in conversion. It is equal to $1/2^n$

10. To interface an A/D converter with the microprocessor, what does the microprocessor do?

The microprocessor should:
- Send a pulse to the start pin
- Wait until the end of the conversation
- Read the digital signal at the input port

11. What is interfacing
- Interfacing a microprocessor is to connect it with various peripherals to perform various operations to obtain a desired output.
- Memory Interfacing is used when the microprocessor needs to access memory frequently for reading and writing data stored in the memory. It is used when reading/writing to a specific register of a memory chip.
- I/O Interfacing is achieved by connecting keyboard (input) and display monitors (output) with the microprocessor.

12. Define LED

A light-emitting diode (LED) is a semiconductor device that emits visible light when an electric current passes through it. The light is not particularly bright, but in most LEDs it is monochromatic, occurring at a single wavelength. The output from an LED can range from red (at a wavelength of approximately 700 nanometers) to blue-violet (about 400 nanometers). Some LEDs emit infrared (IR) energy (830 nanometers or longer); such a device is known as an *infrared-emitting diode* (IRED).

13. What is meant by temperature control

Temperature control is a process in which change of temperature of a space (and objects collectively there within) is measured or otherwise detected, and the passage of heat energy into or out of the space is adjusted to achieve a desired average temperature.

14. List the types of stepper motors.

They are
- Permanent Magnet Stepper motor
- Variable Reluctance Stepper motor
- Hybrid Stepper motor

Unit-4

Chapter 6:

1. Define a programmable logic controller.
   A programmable logic controller (PLC) is a microprocessor based controller that uses a programmable memory to store instructions and to implement functions such as logic, sequencing, timing, counting and arithmetic in order to control machines and process.

2. What are the main component parts of a PLC?
   1. Central processing unit (CPU)
   2. The input/output unit
   3. The programming device
   4. Memory unit.

3. What is the function of programming devices?
   The programming device is used to enter the required program using ladder logic into the memory of the processor. The sequence of operation and ultimate control of equipment or machinery is specified and determined by ladder programme.

4. List various types of PLC programming devices.
   1. Use of hand held programmer
   2. Terminal with video display unit
   3. A personal computer with appropriate software.

5. List down the types of buses required in a PLC.
   1. Data buses for communications data between elements.
   2. The address buses to read the address of locations for accessing stored data.
   3. Control buses for internal control actions.

6. What is ALU? State its function.
   The ALU is responsible for data manipulation and performs arithmetic and logical operations such as addition and subtraction. In addition, the ALU contains a number of control inputs, which specify the data manipulation function to be performed. ALU is combinational logic circuit, whose output is an instantaneous function of its data and control inputs.

7. Highlight the important role of control unit.
   The control unit is used to control the timing of operation and to control the units within the microprocessor to ensure that operations are carried out in the correct order.

10. What are counters?

Counters allow a number of occurrences of input signals to count or record the number of times some event occurs. PLCs include some form of counting element and are set to some preset number value. When this value of input pulse has been received, it will operate its contact, the normally open contacts would be closed and a normally closed contact would be opened.

11. Write down various types of counters.

1. Down counters
2. Up-counters

12. When are cascaded counters needed?

In some applications, it may be required to count events that exceed the maximum number allowable per counter instruction. The counters are programmed in series to produce an output in way that the output of first counter is programmed into the input of the second counter.

13. At what conditions master control is used?

It is often necessary to provide means of executing sections of the control logic when certain criteria are realized. They include instructions comprising the override instruction.

14. How does jump control work?

The jump instruction is an output instruction enabling part of a ladder program to be jumped over. With jump instruction, the processor scan time can be reduced by jumping over instructions not pertinent to the machine operation thereby missing intermediate program and can skip instruction when a production fault occurs.

15. Categorize data manipulation in shift registers.

1. Data transfer
2. Data comparison.

16. List down PLC programming methods.

1. Structured text
2. Ladder diagrams
3. Function block diagram
4. Sequential function charts
5. Instruction list

17. What are the types of memory?

1. Random Access Memory
2. Read Only Memory (ROM)

18. How will you process the input and output of PLC?

Programmable logic controllers are purpose-built computers consisting of three functional areas: processing, memory and input/output. Input conditions to the PLC are sensed and then stored in memory, where the PLC performs the programmed logic instructions on these input states. Output conditions are then generated to drive associated equipment. The action taken depends totally on the control program held in memory.

The important processes are:

Input Scan, Program Scan and Output scan.

The input/output unit of PLCs handles the job of interfacing high power industrial devices to the low-

power electronic circuitry that stores and executes the control program.

19. List down the input and output modules interface.

The input module has two functions: reception of an external signal and status display of that input point. Types of Input modules are:

* DC voltage (110, 220, 14, 24, 48, 15-30V) or current (4-20 mA).
* AC voltage (110, 240, 24, 48V) or current (4-20 mA).
* TTL (transistor transistor logic) input (3-15VDC).
* Analog input (12-bit).
* Word input (16-bit/parallel).
* Thermocouple input.
* Resistance temperature detector.
* High current relay.
* Low current relay.
* Latching input (24VDC/110VAC).
* Isolated input (24VDC/85-132VAC).
* Intelligent input (contains a microprocessor).
* Positioning input.
* PID (proportional, integral, differentiation) input.
* High-speed pulse.

The output module transmits discrete or analog signals to activate various devices such as hydraulic actuators, solenoids, motor starters, and displays the status (through the use of LEDs) of the connected output points. Signal conditioning, termination, and isolation are also part of the output module's functions.

Types of Output modules are:

* DC voltage (24, 48,110V) or current (4-20 mA).
* AC voltage (110, 240v) or current (4-20 mA).
* Isolated (24VDC).
* Analog output (12-bit).
* Word output (16-bit/parallel).
* Intelligent output.
* ASCII output.
* Dual communication port.

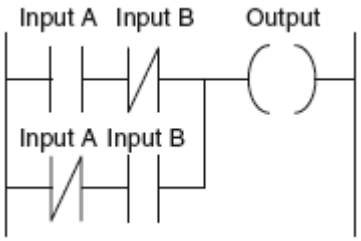
20. What are the features of PLC?

PLCs require shorter installation and commissioning times than do hard-wired systems. Although PLCs are similar to 'conventional' computers in term of hardware technology, they have specific features

suited for industrial control:
(a) Rugged, noise immune equipment;
(b) Modular plug-in construction, allowing easy replacement or addition of units (e.g. input/output);
(c) Standard input/output connections and signal levels;
(d) Easily understood programming language;
(e) Ease of programming and reprogramming in-plant;
(f) Capable of communicating with other PLCs, computers and intelligent devices;
(g) Competitive in both cost and space occupied with relay and solid-state logic systems;

These features make programmable controllers highly desirable in a wide variety of industrial-plant and process-control situations.

21. Draw the ladder diagram for Ex-or gate.



22. What is an internal relay in a PLC?

An internal relay in a PLC system is a programmed internal memory bit with no link to the outside real world. In Allen Bradley, for example, would be a "B3" memory location; in Siemens, it would be a "M" memory location. You generally use this for program control. There are also some special relays that are dedicated to performing only one task. Some are always on while some are always off. Some are on only once during power-on and are typically used for initializing data that was stored.

23. What is an output relay in a PLC?

An output relay in a PLC system is a programmed internal memory bit with a link to the outside real world. In Allen Bradley, for example, would be a "O" memory location; in Siemens, it would be a "Q" memory location. This memory location is linked to an AC or DC digital output card.

Unit-5

Chapter 4:

1. What is the function of hydraulic power system?

   A hydraulic power system converts the hydraulic pressure into translational or rotational motion.

2. How do you define pneumatic system?

   A pneumatic system supplies air to the pressure vessel through a pipe line and resistance to flow is provided by a constriction.

3. Name the control components in a hydraulic actuation system.

   The components are:

   - Hydraulic linear or rotary cylinders
   - Hydraulic pump
   - Electric motor
   - Cooling system
   - Reservoir
   - Servo valve (spool valve)
   - Safety check valves

4. What is servo motor?

   A servomotor is a DC, AC, brushless or even stepper, motor with feedback that can be controlled to move at a desired speed for a desired angle of rotation. To do this, a feed back device sends signals to the controller circuit of the servomotor reporting its angular position and velocity.

5. Highlight the properties of a stepper motor.

   - Stepper motor knows the angle in advance, every time a signal is sent.
   - They are considered as constant power devices.
   - No feed back
   - When load level is lesser than torque, steps will not be missed.
   - When load level is greater than torque, steps may be missed.
   - Stepper motor develops their maximum torque called holding torque at Zero angular velocity, when rotor is stationary.
   - Torque developed with no power is called detent torque
   - When speed increases, torque will decrease.

6. Difference between hydraulic and pneumatic systems

Pneumatics	Hydraulics
Confined pressurized systems that use moving air or other gases	Confined pressurized systems that use moving liquids
Because gases can be compressed, there is a delay in the movement, the force.	Liquids are not very compressible; there is no delay in the movement.
Lowest power to weight ratio	Highest power to weight ratio
No leaks or sparks	May leak. Not fit for clean room applications
Compliant systems	Low compliance
Noisy systems	Can be expensive and noisy. Requires maintenance
Requires air pressure, filter, etc.	Requires pump, reservoir, motor, hoses, etc.
Very low stiffness. Inaccurate response	Stiff system, high accuracy, better response
Examples: -precision drills used by dentists -pneumatic brakes (air brakes) used by buses, trucks, trains -tampers used to pack down dirt and gravel -lungs -nail gun -dentist chair	Examples: -Dump truck lift -Hydraulic Lift to lift cars -Jaws of lift -blood in body -used in cars

7. What are the functions of mechanical actuation systems?

Actuation systems are the elements of control systems which are responsible for transforming the output of a microprocessor or control system into a controlling action on a machine or device.

Mechanical devices are motion converters: they transform motion from one form into another form. For example they transform linear motion into rotational motion.

The actuators must have enough power to accelerate and decelerate the link to carry the loads.

Mechanical elements may include the usage of linkages, cams, gears, rack and pinion, chains, belt drives

Examples: Force amplification given by levers; change of speed given by gears; transfer of rotation about one axis to rotation about another using timing belt.

8. What is DC motor

DC motors DC motors operate through the use of a DC signal. DC motors can either have stator magnetic poles produced by a permanent magnet (generally found in small motors), or else the magnetic field is produced via a stator winding, in which case both the rotor armature and the stator winding have to be energised to drive the motor. DC motor speed is controlled by the voltage supplied to the armature. For motors with stator windings, speed control is also possible through varying the current to the stator. Standard DC motors tend to suffer from brush wear. Alternative DC motor

designs include brushless motors where the brush and commutator are eliminated, and thus give a higher reliability

9. What is AC motor

AC motors are driven by an alternating current supply to the stator windings. The rotor can either consist of a permanent magnet in the case of a synchronous AC motor, or of a simple closed-loop conductor (generally in the form of a 'cage') for asynchronous, induction motors. The speed of AC motors is determined by the input signal frequency. Thus speed control is obtained via variation of the signal frequency.

10. What is Stepper motor

Stepper motors have the ability to rotate a specific number of revolutions or fractions of a revolution, thus being able to achieve a specific angular displacement rather than continuous rotation. There are various designs of stepper motors but primarily all require the sequential switching of a number of stator coils to provide rotation. This sequential switching is generally provided with appropriate drive circuitry, the switching frequency determining the speed whereas the number of switching actions determining the angle of rotation.

Chapter 7:

1. List the drawbacks of traditional design approach.

   The drawbacks are:

   - It is based on traditional system such as mechanical, hydraulic and pneumatic.
   - Less flexible and less accurate
   - More complicate mechanism in design
   - It involves more components and moving parts.

2. Compare traditional and mechatronic design

Sl. no	*Traditional design*	*Mechatronics design*
1	It is based on traditional system such as mechanical, hydraulic and pneumatic	It based on mechanical, electronics, computer technology and control engineering
2	Less flexible	More flexible
3	Less accurate	More accurate
4	More complicate mechanism in design	Less complicate mechanism design
5	It involves more components and moving parts	It involves fewer compounds and moving parts.

3. list the sensors & actuators used in pick & place robot systems
   Actuators: AC motor, DC gear motor, stepper motor
   Sensors: Limit Switches, RF transmitter / receiver

4. What is an engine management?

An electronic engine management system is made up of sensors, actuators, and related wiring that is tied into a central processor called microprocessor or microcomputer (a small version of a computer). The objective of the system is being to ensure that the engine is operated at its optimum settings.

5. What are the uses of sensors?

They detect a mechanical condition (movement or position), chemical state, or temperature conditioning and change it into electrical signals that can be used by the microcomputer which makes decisions based on information it receives from sensors.

6.

What are the stages in designing a mechatronics system?
(Or) Mention the stages in designing a mechatronics system.
i. Need for design
ii. Analysis of problem
iii. Preparation of specification.
iv. Generation of possible solution
v. Selection of suitable solution or Evaluation
vi. Production of detailed design
vii. Production of working drawing.

. Mention any four statements about the problem definition.
- Mass and dimensions of design
- Type and range of motion required
- Accuracy of the element
- Input and output requirements of elements.

What is the function of decoder?
Decoder is used to convert the data from micro controller into seven segment data to glow the LED segments.

What are the various movements of robots?
- Clockwise and anticlockwise rotation of robot unit in its base.
- Linear movement of the arm horizontally i.e., extension or concentration of arm.
- Up and down movement of the gripper.

Name the two barriers used in automatic car parking system and state its uses.
There are two barriers used namely in barriers and out barriers. In barriers is used to open when the correct money is inserted while out barrier opens when the car is detected in front of it.

List the various sensors contained in engine management system.
Temperature sensor hot wire anemometer oil and pressure sensors oxygen sensor.

Point out the two important operations categories of sensors in engine management.

i. Reference voltage sensors Reference voltage sensors provide input to the microprocessor by modifying or controlling constant, predetermined voltage signal.

ii. Voltage generation sensors This varying voltage signal, when received by the microprocessor enables the microprocessor to monitor and adjust for changes in the computerized engine control system.

List out the various sensors used in engine management system.

I. Throttle-position sensors
II. Exhaust Gas Oxygen (EGO) sensors
III. Manifold Absolute Pressure (MAP) sensors
IV. Temperature sensors
V. Speed/Timing sensors
VI. Engine position sensor
VII. EGR diagnostic switch
VIII. EGR Valve position sensor.
IX. Coolant temperature sensor
X. Intake air temperature sensor.