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Question Bank

Details of the Course

Academic Year	**: 2025 – 2026**
Regulation	**: 2021**
Name of the Department	**: Electronics & Communication Engineering**
Name of the Course	**: Mechatronics**
Course Code	**: OMR351**
Semester	**: VII**
Common To Programme(s)	**:**

Course Outcome: (List the Course Outcomes of the Course)

On completion of this course, the students will be able to

CO1: Select sensors to develop mechatronics systems.

CO2: Explain the architecture and timing diagram of microprocessor, and also interpret and develop programs.

CO3: Design appropriate interfacing circuits to connect I/O devices with microprocessor.

CO4: Apply PLC as a controller in mechatronics system.

CO5: Design and develop the apt mechatronics system for an application.

Bloom's Level: BL1-Remembering, BL2-Understanding, BL3-Applying, BL4-Analyzing, BL5–Evaluating, BL6-Creating.

UNIT- I – INTRODUCTION AND SENSORS				
	PART – A (2 Marks)	**Bloom's Level**	**Course Outcome**	**Marks Allotted**
1.	What are the basic constituent elements of a measurement system?	[BL1]	[CO1]	[2]
2.	How does an Eddy current proximity sensor work?	[BL2]	[CO1]	[2]
3.	What are the key elements of Mechatronics systems?	[BL1]	[CO1]	[2]
4.	Write an example for transducer and state its transduction principle.	[BL2]	[CO1]	[2]
5.	Write about the Bimetallic strips.	[BL1]	[CO1]	[2]
6.	Define response time and time constant based on sensors response time.	[BL2]	[CO1]	[2]
7.	What are the needs of mechatronics?	[BL1]	[CO1]	[2]
8.	Illustrate how capacitive sensor works when area changes.	[BL2]	[CO1]	[2]
9.	Define sensitivity and precision.	[BL1]	[CO1]	[2]
10.	What is seeback effect or thermoelectric effect?	[BL2]	[CO1]	[2]
	Descriptive Questions (13/15 Marks)			
1.	Explain the design consideration and steps involved in Mechatronics system Development.	[BTL4]	[CO1]	[13]
2.	Explain the principle, construction and applications of Hall effect sensor with suitable diagram.	[BTL3]	[CO1]	[13]
3.	Brief the construction and working principle of following: (i) Strain gauge. (ii) Capacitive sensor. (iii) LVDT.	[BTL2]	[CO1]	[13]

4.	Write short notes on thermistor, RTD and closed loop system?	[BTL2]	[CO1]	[13]
5.	Explain the static and dynamic characteristics of transducer.	[BTL4]	[CO1]	[13]
6.	Explain in detail about the emerging areas of Mechatronics.	[BTL2]	[CO1]	[13]
7.	Explain in detail about the Hall effect sensor.	[BTL2]	[CO1]	[15]
8.	Explain in detail about the Eddy current proximity sensor.	[BTL5]	[CO1]	[15]
9.	Formulate the factors to be considered for the selection of sensor.	[BTL5]	[CO1]	[15]
10.	Describe the Linear & Rotary potentiometer in detail.	[BTL5]	[CO1]	[15]
UNIT- II – 8085 MICROPROCESSOR				
	PART – A (2 Marks)	**Bloom's Level**	**Course Outcome**	**Marks Allotted**
1.	Write an assembly language program (ALP) to find out two's complement of an 8-bit number.	[BTL3]	[CO2]	[2]
2.	Indicate the number of machine cycles in STA 4800 instruction and state what are they?	[BTL1]	[CO2]	[2]
3.	What is the function of Arithmetic Logic Unit?	[BTL2]	[CO2]	[2]
4.	What are the difference between Microprocessor and Microcontroller ?	[BTL2]	[CO2]	[2]
5.	List the various types of addressing modes.	[BTL1]	[CO2]	[2]
6.	Sketch the functional pin description of 8085.	[BTL2]	[CO2]	[2]
7.	What are the buses in Microprocessor?	[BTL2]	[CO2]	[2]
8.	How many machine cycle does 8085 have, mention them.	[BTL1]	[CO2]	[2]
9.	What are the function of Accumulator and Register?	[BTL2]	[CO2]	[2]
10.	Differentiate between Machine Language and Assembly Language Program.	[BTL2]	[CO2]	[2]
Descriptive Questions (13/15 Marks)				
1.	Draw and explain the architecture of 8085 Microprocessor and explain each block.	[BTL3]	[CO2]	[13]
2.	Draw and explain the Timing of RET instruction. The opcode for RET instructions 'C9'.	[BTL3]	[CO2]	[13]
3.	Explain the internal Architecture of 8085 Microprocessor.	[BTL2]	[CO2]	[13]
4.	Explain the various types of Addressing modes in 8085 Microprocessor.	[BTL4]	[CO2]	[13]
5.	Explain the instruction set of 8085 Microprocessor.	[BTL2]	[CO2]	[13]
6.	Describe with timing diagram the memory read cyclein8085.	[BTL3]	[CO2]	[13]
7.	(i) Draw the opcode fetch machine cycle of 8085. (ii) Discuss briefly about pin configuration of 8085 microprocessor with neat diagram.	[BTL5]	[CO2]	[15]
8.	With suitable example explain the 8085 microprocessor interrupt system in details.	[BTL5]	[CO2]	[15]
9.	Compare and contrast CALL and JUMP instructions in 8085 with examples.	[BTL5]	[CO2]	[15]
10.	Write an ALP (Assembly Language Program) to add two 8-bit numbers and store the result in memory.	[BTL6]	[CO2]	[15]
UNIT- III – PROGRAMMABLE PERIPHERAL INTERFACE				
	PART – A (2 Marks)	**Bloom's Level**	**Course Outcome**	**Marks Allotted**
1.	Distinguish between Peripheral I/O and memory mapped I/O.	[BTL2]	[CO3]	[2]

2.	Define resolution and full scale output of DAC.	[BTL1]	[CO3]	[2]
3.	Give the working of DAC.	[BTL2]	[CO3]	[2]
4.	What is the need of interfacing?	[BTL2]	[CO3]	[2]
5.	Draw the pin detail of 8255.	[BTL3]	[CO3]	[2]
6.	State the CWR of 8255.	[BTL1]	[CO3]	[2]
7.	Write the features of 8255.	[BTL1]	[CO3]	[2]
8.	What is the function of read/write control logic in 8255 PPI ?	[BTL2]	[CO3]	[2]
9.	What are the operating modes of PPI?	[BTL1]	[CO3]	[2]
10.	What is the bit set reset mode of 8255 PPI?	[BTL2]	[CO3]	[2]
Descriptive Questions (13/15 Marks)				
1.	A stepper motor of 200 steps/rev is to be interfaced with 8255 PPI and 8085 Microprocessor to make 90º angular rotation clockwise. write an ALP for the same.	[BTL3]	[CO3]	[13]
2.	Demonstrate the circuit for interfacing stepper motor interface using 8085 Microprocessor and PPI.	[BTL3]	[CO3]	[13]
3.	Briefly explain the pin description, architecture and control modes of 8255 in details.	[BTL2]	[CO3]	[13]
4.	Demonstrate LED interface with 8255.	[BTL3]	[CO3]	[13]
5.	Describe the seven segment LED interface with microprocessor.	[BTL2]	[CO3]	[13]
6.	Describe the traffic control interface using 8255 microprocessor.	[BTL3]	[CO3]	[13]
7.	Design an interfacing diagram of ADC with 8085 microprocessor in details.	[BTL5]	[CO3]	[15]
8.	Demonstrate the 4×4 keyboard interface of 8085.	[BTL5]	[CO3]	[15]
9.	Summarize safety control system using memory – mapped I/O techniques.	[BTL6]	[CO3]	[15]
10.	Formulate the concept of interfacing a seven segment display with a decoder. Explain the concept with one application	[BTL6]	[CO3]	[15]
UNIT- IV – PROGRAMMABLE LOGIC CONTROLLER				
	PART – A (2 Marks)	**Bloom's Level**	**Course Outcome**	**Marks Allotted**
1.	Draw the ladder rungs to represent either of two, normally open switches have to close for a coil to be energized and operate an actuator.	[BTL3]	[CO4]	[2]
2.	How to select the PLC for your particular applications?	[BTL2]	[CO4]	[2]
3.	Write short notes on ON delay/OFF delay timer?	[BTL2]	[CO4]	[2]
4.	Draw the ladder diagram to represent a latch circuit.	[BTL3]	[CO4]	[2]
5.	What is the criteria need for the selection of a PLC?	[BTL5]	[CO4]	[2]
6.	Why latch circuits are used in PLC?	[BTL2]	[CO4]	[2]
7.	What is ladder programming?	[BTL2]	[CO4]	[2]
8.	List the different programming method of PLC.	[BTL1]	[CO4]	[2]
9.	Define PLC.	[BTL1]	[CO4]	[2]
10.	What is the use of JUMP control in PLCs?	[BTL2]	[CO4]	[2]
Descriptive Questions (13/15 Marks)				

1.	Sketch and explain with Ladder diagram for the following (i) Latch circuit. (ii) Cylinder sequencing circuit.	[BTL3]	[CO4]	[13]
2.	Device a circuit that can be used to start a motor and then delay of 100s start a pump. When the motor is switched off there should be a delay of 10s before the pump is switch off.	[BTL3]	[CO4]	[13]
3.	Brief the construction and I/O details of PLC with neat diagram.	[BTL6]	[CO4]	[13]
4.	Describe the Architecture of PLC with neat sketch.	[BTL2]	[CO4]	[13]
5.	Explain the component of PLC with suitable block diagram.	[BTL2]	[CO4]	[13]
6.	Discuss in detail about the Data Handling Techniques.	[BTL2]	[CO4]	[13]
7.	Explain the architecture of a PLC and its elements.	[BTL4]	[CO4]	[15]
8.	Analyze the function of shift register with suitable timing diagram.	[BTL5]	[CO4]	[15]
9.	Develop a system using a PLC which can be used to control the movement of a piston in a cylinder using a 4/2 solenoid –operated pilot valve . The piston is to move in one direction when a proximity sensor at one end of the stroke closes contacts and in other direction when a when a proximity sensor at other end of the stroke indicates its arrival there.	[BTL6]	[CO4]	[15]
10.	Generalize a circuit that could be used with a domestic washing machine to switch on a pump to pump water for 100s in to the machine , then switch on a heater for 50s to heat the water. The heater is then switched off and another pump to empty the water the machine for 100s.	[BTL6]	[CO4]	[15]
UNIT- V – ACTUATORS AND MECHATRONICS SYSTEM DESIGN				
	PART – A (2 Marks)	**Bloom's Level**	**Course Outcome**	**Marks Allotted**
1.	Write the working principle of servo motors.	[BTL2]	[CO5]	[2]
2.	Differentiate between Traditional design approach and mechatronics design approach.	[BTL4]	[CO5]	[2]
3.	What is the difference between Traditional and Mechatronics Approach?	[BTL4]	[CO5]	[2]
4.	A stepper motor has a step angle of 7.5 degree. How many pulses required for the motor to rotate through five complete revolutions?	[BTL3]	[CO5]	[2]
5.	How does a car park barrier works?	[BTL2]	[CO5]	[2]
6.	What is the working principle of stepper motor?	[BTL2]	[CO5]	[2]
7.	State the characteristics of servo motor.	[BTL2]	[CO5]	[2]
8.	Furnish the drawback of stepper motor.	[BTL1]	[CO5]	[2]
9.	What is the use of PLC in automatic car park system?	[BTL2]	[CO5]	[2]
10.	Write down the application of stepper motor.	[BTL1]	[CO5]	[2]
Descriptive Questions (13/15 Marks)				
1.	Device and explain the construction, working principle, applications and advantages of servo motors with neat sketch.	[BTL2]	[CO5]	[13]
2.	Explain the mechatronics involved in a engine management system with suitable diagram.	[BTL2]	[CO5]	[13]
3.	Discuss a case study about how mechatronics used in automatic camera with suitable diagram and also mention various components involved in this.	[BTL2]	[CO5]	[13]
4.	Describe the design and implementation of mechatronics case study for coin operated Automatic car park barriers.	[BTL3]	[CO5]	[13]
5.	Discuss the roles of sensor in car engine management system? Explain	[BTL2]	[CO5]	[13]

	with neat block diagram.			
6.	Brief the various stages of mechatronics system development.	[BTL2]	[CO5]	[13]
7.	Design a robot to pick and place the object and comment on the various elements in the system.	[BTL5]	[CO5]	[15]
8.	With neat sketch discuss the construction and working of various types of stepper motor?	[BTL4]	[CO5]	[15]
9.	Relate the difference between Traditional and Mechatronics approach with suitable example.	[BTL4]	[CO5]	[15]
10.	Design a Mechatronics system for an automatic room heating system.	[BTL5]	[CO5]	[15]