Reg. No.																

Question Paper Code	13017

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Sixth Semester

Mechanical Engineering

20MEPC603 - MECHATRONICS

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which of the following is a primary function of a sensor? (a) Convert mechanical energy to electrical energy (b) Convert electrical energy to mechanical energy (c) Store electrical energy (d) Amplify electrical signals	1	K1	CO1
2.	A potentiometer is primarily used to_____. (a) Measure electrical resistance (b) Control voltage levels in a circuit (c) Increase the current flow (d) Store electric charge	1	K1	CO1
3.	What type of light sensor works by varying its electrical resistance according to the amount of light falling on it? (a) Photovoltaic cell (b) Thermocouple (c) Phototransistor (d) Light Dependent Resistor (LDR)	1	K2	CO1
4.	How many T-states are typically required for the opcode fetch cycle in the 8085 microprocessors? (a) 2 T-states (b) 3 T-states (c) 4 T-states (d) 6 T-states	1	K1	CO2
5.	What is the purpose of the 'WAIT' state in an 8085-timing diagram? (a) To reset the microprocessor (b) To halt the clock signal temporarily (c) To synchronize slower peripherals with the microprocessor (d) To end the machine cycle	1	K1	CO2
6.	Which of the following registers is not a part of the 8085 microprocessor architecture? (a) Accumulator (A) (b) Stack Pointer (SP) (c) Program Counter (PC) (d) Instruction Queue (IQ)	1	K2	CO2
7.	Which signal is used to select the 8255 chip for communication with the processor? (a) RD (b) WR (c) CS (d) ALE	1	K1	CO3
8.	In keyboard interfacing, what is the common method used to detect key presses? (a) Analog signal processing (b) Interrupt-driven I/O (c) Polling method (d) Direct memory access	1	K1	CO3
9.	For a 7-segment LED display interfaced via 8255, how many data lines are typically required? (a) 4 (b) 7 (c) 8 (d) 9	1	K1	CO3
10.	What type of programming language is most commonly used for programming PLCs? (a) Python (b) Ladder Logic (c) C++ (d) Assembly Language	1	K1	CO4
11.	What type of output is controlled by a PLC to operate devices like motors and lights? (a) Digital Output (b) Analog Output (c) Sequential Output (d) Continuous Output	1	K2	CO4
12.	In data handling, which of the following is typically used for handling complex data structures in PLCs? (a) Arrays (b) Strings (c) Booleans (d) Integers	1	K1	CO4

13.	What is a primary characteristic of a Hybrid Stepper Motor? (a) Uses permanent magnets and a toothed rotor (b) Provides continuous rotation without steps (c) Operates only in open-loop systems (d) Has low torque at high speeds	*1*	*K1*	*CO5*
14.	Which type of motor generally includes a feedback mechanism for closed-loop control? (a) Stepper Motor (b) DC Motor (c) AC Servo Motor (d) Variable Reluctance Stepper Motor	*1*	*K1*	*CO5*
15.	Which of the following is an advantage of stepper motors? (a) High torque at high speeds (b) Precise position control without feedback (c) High energy efficiency (d) Continuous rotation capability	*1*	*K1*	*CO5*
16.	In which application are stepper motors most commonly used? (a) High-speed conveyor systems (b) Precision positioning systems like 3D printers (c) High-torque robotic arms (d) Electric vehicles	*1*	*K2*	*CO5*
17.	Which of the following mechatronic systems is primarily used in manufacturing for precision machining? (a) Electric bicycles (b) Robotic welding systems (c) Smart refrigerators (d) Home automation systems	*1*	*K2*	*CO6*
18.	In pick and place robots, what type of end effector is typically used for grasping objects? (a) Drill (b) Gripper (c) Welding tool (d) Cutter	*1*	*K1*	*CO6*
19.	In an EMS, what role does the Engine Control Unit (ECU) play? (a) It physically adjusts the throttle position (b) It stores all diagnostic trouble codes (c) It processes data from various sensors to control engine functions (d) It only monitors the exhaust emissions	*1*	*K1*	*CO6*
20.	Which sensor type is commonly used in automatic car park barriers to detect the presence of a vehicle? (a) Ultrasonic sensor (b) Infrared sensor (c) Pressure sensor (d) All of the above	*1*	*K1*	*CO6*

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21.	What is the need of Mechatronics?	*2*	*K1*	*CO1*
22.	List the Characteristics of Sensor.	*2*	*K1*	*CO1*
23.	Classify the types of addressing modes of 8085.	*2*	*K2*	*CO2*
24.	Summarize the advantages of microcontroller over microprocessor.	*2*	*K2*	*CO2*
25.	Compare ADC and DAC interface.	*2*	*K2*	*CO3*
26.	What are the various modes of 8255?	*2*	*K1*	*CO3*
27.	Why is PLC preferred over PC in factories?	*2*	*K1*	*CO4*
28.	Mention any two applications of Counters.	*2*	*K1*	*CO4*
29.	Distinguish between stepper motor and Servo motors.	*2*	*K2*	*CO5*
30.	What are the sensors used in engine management system?	*2*	*K1*	*CO6*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a)	Interpret the various elements of a closed loop system in automatic water level controller and describe their functions.	*10*	*K2*	*CO1*
		OR			
	b)	Explain in detail about the following sensors: (i) Thermocouple (ii) Hall effect sensor	*5* *5*	*K2* *K2*	*CO1* *CO1*
32.	a)	Illustrate about the pin configuration of 8085 microprocessor with a suitable sketch.	*10*	*K2*	*CO2*

OR

	b)	Explain different addressing modes of 8051 microcontroller.	*10*	*K2*	*CO2*
33.	a)	Describe the 8255 Programmable Peripheral Interface's architecture.	*10*	*K2*	*CO3*
		OR			
	b)	Explain a traffic light controller using 8255 microcontrollers.	*10*	*K2*	*CO3*
34.	a)	Write short notes on: (i) Timers and counters (ii) Internal relays	*10*	*K2*	*CO4*
		OR			
	b)	Summarize the mnemonics codes for various logic gates.	*10*	*K2*	*CO4*
35.	a)	Explain the construction and working principle of stepper motor	*10*	*K2*	*CO5*
		OR			
	b)	Explain in detail about construction and working of closed loop servo system with suitable example of servomotor control system.	*10*	*K2*	*CO5*
36.	a)	Explain the mechatronics systems in the industrial application of pick and place robot.	*10*	*K2*	*CO6*
		OR			
	b)	Explain the factors to be considered while selecting a PLC for mechatronics system design.	*10*	*K2*	*CO6*