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**BTECH**  
**(SEM V) THEORY EXAMINATION 2024-25**  
**MECHATRONICS SYSTEMS**

TIME: 3 HRS

M.MARKS: 70

**Note:** Attempt all Sections. In case of any missing data; choose suitably.

## SECTION A

1. Attempt *all* questions in brief.

2 x 07 = 14

Q no.	Question	CO	Level
a.	What is the principle of relay?	3	K1
b.	Define a programmable logic controller.	4	K1
c.	List down the types of buses required in a PLC.	4	K1
d.	What are the instruments used to measure linear velocity?	1	K1
e.	List down the different types of timers.	4	K1
f.	Define the term electromechanical systems	1	K1
g.	Define transfer function.	1	K1

## SECTION B

2. Attempt any *three* of the following:

07 x 3 = 21

Q no.	Question	CO	Level
a.	Sketch the basic architecture of a PLC and explain the function of each element.	4	K3
b.	Explain ratchet and pawl mechanisms	3	K2
c.	Explain the specification of a stepper motor. In detail.	3	K2
d.	Identify the various elements of a closed loop control system in an automatic water level controller and describe their functions.	1	K2
e.	Explain the function of air filter with a neat sketch.	2	K2

## SECTION C

3. Attempt any *one* part of the following:

07 x 1 = 07

Q no.	Question	CO	Level
a.	Derive a mathematical differential equation for governing a system of electric motor.	3	K3
b.	Describe adaptive control and digital logic controller.	4	Ke

4. Attempt any *one* part of the following:

07 x 1 = 07

Q no.	Question	CO	Level
a.	Discuss the following actuation system (i) Self excited wound field shunt configuration dc motor (ii) Self excited wound field series configuration dc motor (iii) Stepper motor (iv) Induction motor	3	K2
b.	Write short notes on (i) Thermocouple (ii) Piezoelectric transducer (iii) Incremental encoder (iv) Photovoltaic transducer	1	K2



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**5. Attempt any one part of the following: 07 x 1 = 07**

Q no.	Question	CO	Level
a.	Discuss the following actuation system (i) Self excited wound field shunt configuration dc motor (ii) Self excited wound field series configuration dc motor (iii) Stepper motor (iv) Induction motor	2	K2
b.	Explain the function of a capacitive sensor in a robot end effectors.		K2

**6. Attempt any one part of the following: 07 x 1 = 07**

Q no.	Question	CO	Level
a.	Explain how a PLC can be used to handle an analog input.	4	K2
b.	Discuss the possible design solutions for a pick and place robot.	5	K3

**7. Attempt any one part of the following: 07 x 1 = 07**

Q no.	Question	CO	Level
a.	Explain the design a mechatronics system for an automatic Car Park Systems.	5	K3
b.	Draw the ladder diagram to represent (i) Two switches are normally open and both have to be closed for a motor to operate. (ii) Either of two, normally open, switches has to be closed for a coil to be energized and operate an actuator. (iii) A motor is switched on by pressing a spring –return push button start switch and the motor remains on until another spring –return push button stop switch is pressed.	4	K3