

Branch – APPLIED ELECTRONICS

**MAJOR ELECTIVE COURSE – I SENSORS AND ACTUATORS**

Time: Three Hours

Maximum: 75 Marks

**SECTION-A (10 Marks)**

Answer ALL questions

ALL questions carry EQUAL marks

(10 × 1 = 10)

| Module No. | Question No. | Question                                                                                                                                                                                                                 | K Level | CO  |
|------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----|
| 1          | 1            | Which of the following is a pneumatic actuator?<br>(i) DC Motor<br>(ii) Hydraulic Cylinder<br>(iii) Air Cylinder<br>(iv) Solenoid                                                                                        | K1      | CO1 |
|            | 2            | Which sensor is commonly fabricated using MEMS technology?<br>(i) Mercury thermometer<br>(ii) Accelerometer<br>(iii) Bimetallic strip<br>(iv) Bourdon tube                                                               | K2      | CO1 |
| 2          | 3            | Which temperature sensor works based on the Seebeck effect?<br>(i) RTD<br>(ii) Thermistor<br>(iii) Thermocouple<br>(iv) IR Sensor                                                                                        | K1      | CO2 |
|            | 4            | Which flow sensor has no moving parts and can be installed externally on a pipe?<br>(i) Vortex<br>(ii) Electromagnetic<br>(iii) Ultrasonic<br>(iv) Thermal                                                               | K2      | CO2 |
| 3          | 5            | The operating principle of gas sensors such as MQ sensors is based on what principle?<br>(i) Change in resistance of a semiconductor<br>(ii) Piezoelectric effect<br>(iii) Magnetic induction<br>(iv) Capacitance change | K1      | CO3 |
|            | 6            | Which humidity sensor works based on the change in dielectric constant?<br>(i) Resistive<br>(ii) Thermal conductivity<br>(iii) Optical<br>(iv) Capacitive                                                                | K2      | CO3 |
| 4          | 7            | Which actuator uses feedback to achieve precise position control?<br>(i) Stepper motor<br>(ii) Solenoid<br>(iii) Servo motor<br>(iv) Relay                                                                               | K1      | CO4 |
|            | 8            | Which device supplies compressed air in a pneumatic system?<br>(i) Hydraulic pump<br>(ii) Air compressor<br>(iii) Solenoid<br>(iv) Turbine                                                                               | K2      | CO4 |
| 5          | 9            | Noise in sensor signals can be effectively reduced using _____.<br>(i) Amplifiers only<br>(ii) Shielding and filtering techniques<br>(iii) Increasing temperature<br>(iv) Mechanical actuators                           | K1      | CO5 |
|            | 10           | Select the suitable filter from the following to remove the narrow frequency.<br>(i) Low pass<br>(ii) Band pass<br>(iii) High pass<br>(iv) Band rejection                                                                | K2      | CO5 |

Cont...

**SECTION - B (35 Marks)**Answer **ALL** questions**ALL** questions carry **EQUAL** Marks

(5 × 7 = 35)

| Module No. | Question No. | Question                                                                                 | K Level | CO  |
|------------|--------------|------------------------------------------------------------------------------------------|---------|-----|
| 1          | 11.a.        | Differentiate between analog and digital sensors.                                        | K2      | CO1 |
|            | (OR)         |                                                                                          |         |     |
|            | 11.b.        | Explain any five characteristics of sensor with an example.                              |         |     |
| 2          | 12.a.        | Explain the working principle of thermocouple to measure high temperature in industries. | K4      | CO2 |
|            | (OR)         |                                                                                          |         |     |
|            | 12.b.        | Describe the piezoelectric pressure sensor with its applications.                        |         |     |
| 3          | 13.a.        | Discuss the components of a biosensor with a neat block diagram.                         | K4      | CO3 |
|            | (OR)         |                                                                                          |         |     |
|            | 13.b.        | Explain the working principle of a pH sensor with suitable applications.                 |         |     |
| 4          | 14.a.        | Discuss the role of valves in hydraulic and pneumatic systems.                           | K6      | CO4 |
|            | (OR)         |                                                                                          |         |     |
|            | 14.b.        | Analyze the working principle of a relay with a neat diagram.                            |         |     |
| 5          | 15.a.        | Explain the signal conditioning stages in a typical sensor system.                       | K6      | CO5 |
|            | (OR)         |                                                                                          |         |     |
|            | 15.b.        | Analyze the different types of filters used in sensor signal processing.                 |         |     |

**SECTION - C (30 Marks)**Answer **ANY THREE** questions**ALL** questions carry **EQUAL** Marks

(3 × 10 = 30)

| Module No. | Question No. | Question                                                                                                                      | K Level | CO  |
|------------|--------------|-------------------------------------------------------------------------------------------------------------------------------|---------|-----|
| 1          | 16           | Differentiate between sensors and actuators and explain their roles in an automated control system with a neat block diagram. | K2      | CO1 |
| 2          | 17           | Classify flow sensor and explain electromagnetic and ultrasonic flow sensor with examples.                                    | K4      | CO2 |
| 3          | 18           | Analyze the working principle, advantage and applications of biosensors in healthcare monitoring.                             | K4      | CO3 |
| 4          | 19           | Explain the principles of pneumatic systems and discuss the roles of pneumatic actuators, valves, and air compressors.        | K6      | CO4 |
| 5          | 20           | Evaluate electrostatic, magnetostrictive, and EAP actuators and recommend the best option for a medical device.               | K6      | CO5 |

Z-Z-Z

END