*Total No. of Questions: 6* *Total No. of Printed Pages:3*

**Enrollment No.....**

Faculty of Engineering

End Sem Examination Dec 2024

AU3EL20 Automotive Sensors & Actuators

Programme: B.Tech. Branch/Specialisation: AU/ME

**Duration: 3 Hrs.** **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

| | | | Marks | BL | PO | CO | PSO |
|---|---|---|---|---|---|---|---|
| Q.1 | i. | Which method can reduce dynamic error?<br>(a) By increasing accuracy<br>(b) By increasing precision<br>(c) By reducing sensitivity<br>(d) By reducing time lag | **1** | 01 | 01 | 01 | 01 |
| | ii. | Which among the following transducers is an example of a passive transducer?<br>(a) Chemical transducer<br>(b) Thermoelectric transducer<br>(c) Strain gauge<br>(d) Piezoelectric transducer | **1** | 01 | 01 | 01 | 01 |
| | iii. | Which sensor is used to detect the presence or absence of an object without physical contact?<br>(a) Strain gauge (b) Proximity sensor<br>(c) LVDT (d) GPS sensor | **1** | 01 | 01 | 02 | 01 |
| | iv. | What does LVDT stand for?<br>(a) Linear Voltage Differential Transformer<br>(b) Low Voltage Digital Transducer<br>(c) Longitudinal Variable Distance Transmitter<br>(d) Linear Variable Differential Transformer | **1** | 01 | 01 | 02 | 01 |
| | v. | What physical phenomenon does a hall effect sensor rely on for operation?<br>(a) Electromagnetic induction<br>(b) Hall voltage generation<br>(c) Piezoelectric effect<br>(d) Capacitive coupling | **1** | 01 | 01 | 03 | 01 |

P.T.O.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| vi. | What is the primary function of a knock sensor in an internal combustion engine?<br>(a) To measure exhaust gas temperature<br>(b) To detect abnormal combustion or engine knocking<br>(c) To regulate fuel injection timing<br>(d) To monitor engine coolant temperature | **1** | 01 | 01 | 03 | 01 |
| vii. | In a block diagram, what does a rectangle represent?<br>(a) A summing junction<br>(b) A transfer function<br>(c) A signal input or output<br>(d) A control system component | **1** | 01 | 01 | 04 | 01 |
| viii. | What is the primary function of an error detector in a control system?<br>(a) To measure the difference between the desired and actual output<br>(b) To amplify the input signal<br>(c) To provide feedback to the system<br>(d) To generate reference signals | **1** | 01 | 01 | 04 | 01 |
| ix. | Which component in a pneumatic system converts compressed air into mechanical motion?<br>(a) Cylinder (b) Pump<br>(c) Valve (d) Reservoir | **1** | 01 | 01 | 05 | 01 |
| x. | What is the primary function of a directional control valve?<br>(a) Control pressure (b) Manage fluid path<br>(c) Store fluid (d) Measure temperature | **1** | 01 | 01 | 05 | 01 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Q.2 | i. | What is the difference between sensor and transducer? | **2** | 03 | 01 | 01 | 01 |
| | ii. | Explain the dynamic characteristics of measuring devices. | **3** | 02 | 01 | 01 | 01 |
| | iii. | Classify and explain briefly transducers with the help of neat flowchart. | **5** | 02 | 01 | 02 | 01 |
| OR | iv. | Compare and describe the open and closed loop systems with help of real time applications. | **5** | 03 | 01 | 02 | 01 |



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|---|---|---|---|---|---|---|---|---|
| Q.3 | i. | What are the components of GPS sensor? | **2** | 01 | 01 | 02 | 01 |
| | ii. | Write a short note on:<br>(a) Proximity sensor<br>(b) IR sensor | **8** | 02 | 01 | 02 | 01 |
| OR | iii. | Explain the working and principle of RVDT with neat sketch. | **8** | 02 | 01 | 02 | 01 |
| Q.4 | i. | Write a short note on gas sensor. | **3** | 02 | 01 | 03 | 01 |
| | ii. | Elaborate the different types of automobile sensors with neat sketch. | **7** | 03 | 01 | 03 | 01 |
| OR | iii. | Explain the working, principle of ultrasonic sensor. Give advantages & disadvantages also. | **7** | 03 | 01 | 03 | 01 |
| Q.5 | i. | Write a short note on block diagram. | **4** | 02 | 01 | 04 | 01 |
| | ii. | Describe briefly feedback control system characteristics. | **6** | 02 | 01 | 04 | 01 |
| OR | iii. | Explain the concept of signal flow graph with example. | **6** | 03 | 01 | 04 | 01 |
| Q.6 | i. | Define actuators. | **2** | 01 | 01 | 05 | 01 |
| | ii. | Explain the different types of actuators. | **8** | 02 | 01 | 05 | 01 |
| | iii. | Describe the classification of directional control valve. | **8** | 02 | 01 | 05 | 01 |

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## Marking Scheme
## AU3EL20 (T) Automotive Sensors & Actuators (T)

| | | | |
|---|---|---|---|
| Q.1 | i) | d) By reducing time lag | **1** |
| | ii) | c) Strain gauge | **1** |
| | iii) | b) Proximity sensor | **1** |
| | iv) | d) Linear Variable Differential Transformer | **1** |
| | v) | b) Hall voltage generation | **1** |
| | vi) | b) To detect abnormal combustion or engine knocking | **1** |
| | vii) | d) A control system component | **1** |
| | viii) | a) To measure the difference between the desired and actual output | **1** |
| | ix) | a) Cylinder | **1** |
| | x) | b) Manage fluid path | **1** |

| | | | |
|---|---|---|---|
| Q.2 | i. | Two differences between sensor and transducer. 1 mark each | **2** |
| | ii. | Any Three dynamic characteristics of measuring devices with explanation. 1 mark each | **3** |
| | iii. | Classify 2 marks<br>explain briefly Transducers 2 marks<br>flowchart 1 marks | **5** |
| OR | iv. | open loop system 2.5 marks<br>closed loop systems 2.5 marks | **5** |

| | | | |
|---|---|---|---|
| Q.3 | i. | 4 components 2 marks | **2** |
| | ii. | Write a short note on:<br>a) Proximity sensor 4 marks<br>b) IR Sensor 4 marks | **8** |
| OR | iii. | Explanation with working 4 marks<br>and principle of RVDT 3 marks | **8** |

| | | | |
|---|---|---|---|
| | | neat sketch. 1marks | |
| Q.4 | i. | short note on gas sensor. 3 marks | **3** |
| | ii. | Name the different types of automobile sensors 3marks<br>Explanation with neat sketch. 4 marks | **7** |
| OR | iii. | Explain the working, principle of Ultrasonic sensor. 4marks<br>Give advantages & disadvantages also. 3marks | **7** |
| Q.5 | i. | short note on Block diagram 2 marks<br>with diagram 2 marks | **4** |
| | ii. | Feedback control system characteristics. 6marks | **6** |
| OR | iii. | concept of signal flow graph 3 marks<br>example 3 marks | **6** |
| Q.6 | i. | Define Actuators. 2 marks | **2** |
| | ii. | Explain the different types of actuators with neat sketch 8 marks | **8** |
| | iii. | Describe the classification of directional control valve. 8 marks | **8** |

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