



**B.E DEGREE EXAMINATIONS: NOV/DEC 2024**

(Regulation 2018)

Sixth Semester

**AUTOMOBILE ENGINEERING**

U18AUI6201: Automotive Embedded Systems

**COURSE OUTCOMES**

- CO1:** Select suitable sensors for measuring parameters in automotive systems  
**CO2:** Choose the appropriate actuator and driver for automotive applications  
**CO3:** Outline the concepts of embedded systems  
**CO4:** Design of hardware model for automotive system using microcontroller  
**CO5:** Build codes for automotive embedded applications  
**CO6:** Compare the wired and wireless communication protocols

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions: -**

**PART A (10 x 2 = 20 Marks)**

**(Answer not more than 40 words)**

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|---|-----|-------------------|
| 1. Identify the primary function of proximity sensors in automotive applications.               | CO1 | [K <sub>3</sub> ] |
| 2. Differentiate between a thermocouple and a thermistor used in automotive temperature sensing | CO1 | [K <sub>2</sub> ] |
| 3. List the types of solenoids commonly used in automotive applications.                        | CO2 | [K <sub>1</sub> ] |
| 4. Outline the advantages of using BLDC motors in automotive applications.                      | CO2 | [K <sub>2</sub> ] |
| 5. Summarize the role of a Digital-to-Analog Converter (DAC) in automotive applications.        | CO3 | [K <sub>2</sub> ] |
| 6. List the key elements that make up the structure of an embedded program.                     | CO3 | [K <sub>1</sub> ] |
| 7. Explain the concept of data acquisition in the context of sensor interfacing.                | CO4 | [K <sub>2</sub> ] |
| 8. Identify the purpose of Pulse Width Modulation (PWM) in motor control applications.          | CO4 | [K <sub>3</sub> ] |
| 9. State the function of the master and slave devices in I2C communication.                     | CO6 | [K <sub>1</sub> ] |
| 10. Compare the maximum data transfer rates of SPI and I2C protocols.                           | CO6 | [K <sub>2</sub> ] |

**Answer any FIVE Questions:-**

**PART B (5 x 16 = 80 Marks)**

**(Answer not more than 400 words)**

- |  |    |     |                   |
|--|----|-----|-------------------|
| 11. a) Compare the roles of MAP and MAF sensors in engine control, including their measurement techniques. | 12 | CO1 | [K <sub>2</sub> ] |
|--|----|-----|-------------------|

	b)	Illustrate how position sensors are used in automotive throttle control systems.	4	CO1	[K <sub>2</sub> ]
12.	a)	Explain the working principle of piezoelectric actuators and their use in fuel injection systems and list the advantages and limitations of piezoelectric actuators in automotive applications.	12	CO2	[K <sub>2</sub> ]
	b)	Analyze the limitations and advantages of transistor drivers over relays.	4	CO2	[K <sub>4</sub> ]
13.	a)	Explain the role of the ADC, DAC, and timers, CPU in the microcontroller architecture.	12	CO3	[K <sub>2</sub> ]
	b)	Outline the importance of interrupts in real-time processing.	4	CO3	[K <sub>2</sub> ]
14.	a)	Design an embedded system that integrates multiple sensors and actuators.	12	CO5	[K <sub>6</sub> ]
	b)	Construct an example code that demonstrates how to initialize the display and display dynamic information (like speed or temperature).	4	CO5	[K <sub>3</sub> ]
15.	a)	Explain the operation and benefits of the CAN protocol in vehicle networking, emphasizing its importance in safety-critical systems.	12	CO6	[K <sub>2</sub> ]
	b)	Illustrate how IoT technologies can enhance automotive systems through wireless communication protocols. Provide examples of practical applications.	4	CO6	[K <sub>2</sub> ]
16.	a)	Analyze the advantages and disadvantages of using SPI and I2C protocols in automotive applications. Provide examples for each.	12	CO6	[K <sub>4</sub> ]
	b)	Explain the role of pressure sensors in fuel and brake systems of vehicles.	4	CO1	[K <sub>2</sub> ]

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