



B.E/B.TECH DEGREE EXAMINATIONS: APRIL /MAY 2024

(Regulation 2021)

Sixth Semester

COMMON TO ECE/EIE/MCE

U18ECE0057: Introduction to HMI

COURSE OUTCOMES

- CO1:** Explain the applications of HMI's in various domains.
CO2: Differentiate various communication protocols used in HMI Development.
CO3: Describe car multimedia systems and the hardware, software evolution.
CO4: Summarize various tools used for HMI development for automobile application.
CO5: Explain the importance of user experience with a case study.
CO6: Use various graphic tools and advanced techniques to create UI's.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions: -

PART A (10 x 2 = 20 Marks) (Answer not more than 40 words)

1. Outline how HMI applications differ in the automotive, industrial, and consumer electronics domains. CO1 [K₂]
2. Illustrate the role of HMI in the medical and aerospace domains, highlighting their importance in ensuring safety and efficiency. CO1 [K₂]
3. Explain the role of Human-Machine Interface (HMI) in automotive electronics. CO2 [K₂]
4. summarize the significance of communication protocols like CAN, LIN, MOST, FlexRay, and Ethernet in automotive Electronic Control Units (ECUs). CO2 [K₂]
5. Outline the evolution of car multimedia systems, detailing the progression from basic instrument clusters to advance in-vehicle infotainment and entertainment systems. CO3 [K₂]
6. Summarize the hardware, software, and mechanics involved in different car multimedia components, including instrument clusters, in-vehicle infotainment systems, professional systems, and rear seat entertainment. CO3 [K₂]
7. Interpret the need for widgets in HMI design. Illustrate an example for a widget. CO4 [K₂]
8. Define state machine. CO4 [K₁]
9. Differentiate between doing the things right and doing the right things. CO5 [K₂]

10. List different sensors used for user interaction in the present-day cars. CO6 [K₁]

**Answer any FIVE Questions: -
PART B (5 x 16 = 80 Marks) (Answer not more than 400 words)**

11. a) Illustrate a CAN architecture connection of different sensors connected with the ECU. Examine why CAN is the most suitable communication protocol for automotive applications. 10 CO2 [K₄]

b) Infer the role of ECU in a CAR. List the functionalities of an ECU. 6 CO2 [K₂]

12. As a designer for Tesla, envision yourself tasked with creating an in-vehicle infotainment system for an autonomous concept car. Describe the design elements and functionalities you would integrate into the system to enhance the overall user experience. Justify your design. 16 CO3 [K₅]

13. a) What is a state machine? Design a state machine illustrating the fetching of vehicle speed and milage data from the ECU and displaying it in the instrument cluster. 10 CO4 [K₆]

b) Explain Model View Controller architecture. 6 CO4 [K₂]

14. a) Explain in detail the double diamond process. 10 CO5 [K₂]

b) Illustrate the software development life cycle for automotive design. 6 CO5 [K₂]

15. a) Justify the need of asset design. Explain any one of the tools used for asset design in automotive HMI and subsequently illustrate an asset design of your choice. 10 CO5 [K₃]

b) Differentiate UI and UX 6 CO5 [K₂]

16. a) You are leading a team in designing a futuristic automotive user interface (UI) for an electric autonomous vehicle. Illustrate and discuss how to incorporate multiple advanced technologies such as voice recognition, gesture control, and augmented reality into the UI design to enhance user interaction and experience. 10 CO6 [K₃]

b) Explain the significance of UI analytics (usage patterns) and performance profiling in the development and optimization of automotive user interfaces. Provide examples of how these tools can be used to improve user experience and system efficiency in uber or ola. 6 CO6 [K₂]
