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**Question Paper Code : 81664**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

Seventh Semester

Mechanical Engineering

ME 3791 — MECHATRONICS AND IOT

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a transducer?
2. Mention any two differences between fiber optic and non-fiber optic sensors.
3. Name any two semiconductor switching devices.
4. Draw the Darlington pair circuit.
5. List any two-communication protocol used in IoT.
6. Define IDE.
7. Name two typical peripherals of the Raspberry Pi.
8. List the features of Node MCU.
9. Name any two vision-based robot application.
10. Define ABS in automotive mechatronics.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the working of Brushless Permanent Magnet DC Motors. What are their advantages over conventional brushed motors?

Or

- (b) List and explain various actuators used in mechatronic systems. Highlight their selection criteria based on application needs.

12. (a) Explain the working of inverting and non-inverting op-amp circuits. Derive the output voltage expressions and discuss their practical applications.

Or

- (b) Describe the architecture of a PLC. Explain how it processes inputs and outputs and controls a mechatronic system.
13. (a) Discuss the technologies of IoT such as cloud, wireless communication, sensors and embedded systems. Explain their roles with examples.

Or

- (b) Differentiate between single-chip microcontroller systems, single-board microcontroller systems, and single-board computers. Provide examples and applications of each.
14. (a) With a neat diagram, explain the interfacing of a DHT11 (temperature and humidity) sensor with Arduino. Write a program to display the readings on a serial monitor.

Or

- (b) Describe the use of ESP8266 Wi-Fi module. Explain, with example, the process of connecting it with Arduino for IoT applications.
15. (a) Explain the concept and working Adaptive Cruise Control (ACC). Describe the sensors and feedback mechanism used.

Or

- (b) Explain the working of the electronic ignition system used in automotive mechatronics. How does it improve fuel efficiency and engine performance?

**PART C — (1 × 15 = 15 marks)**

16. (a) Design a Mechatronics System to automate the irrigation of a greenhouse using sensors and actuators. Include the logic used to start/stop pumps and maintain optimal environmental conditions.

Or

- (b) Design an autonomous robot with a vision system for object detection and path tracking. Explain camera usage, processing steps, and motor control logic.