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Question Paper Code : 90212

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2025.

Second Semester

Mechanical Engineering

BE 3251 — BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to : Aeronautical Engineering/Aerospace Engineering/Automobile Engineering/Biomedical Engineering/Computer Science and Design/Computer Science and Engineering/Computer Science and Engineering (Artificial Intelligence and Machine Learning)/Computer Science and Engineering (Cyber Security)/Computer Science and Engineering (Data Science)/Computer and Communication Engineering/Industrial Engineering/Industrial Engineering and Management/Manufacturing Engineering/Marine Engineering/Materials Science and Engineering/Mechanical Engineering (Sandwich)/Mechanical Engineering (Specialised in Automobile)/Mechanical Engineering (Specialised in Smart Manufacturing)/Medical Electronics/Production Engineering/Safety and Fire Engineering/Artificial Intelligence and Data Science/Computer Science and Business Systems/Information Technology)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Determine the emf of the battery in the circuit shown in Fig. 1. [Figure: a 6.25 ohm resistor in series with a parallel combination of 2 ohm and 6 ohm resistors, connected across a battery Vdc]
2. Define RMS value of an ac quantity.
3. Draw the circuit of DC shunt motor and DC series motor.
4. Mention the applications of alternator.
5. Draw the I-V characteristics of a Zener diode.
6. What do you mean by rectifier? What are its applications?
7. Convert $(857)_{10}$ to binary number.
8. What is a Multiplexer? Draw its circuit.
9. What is meant by standards of instruments? Give example.
10. What are instrument transformers? What are their purposes?

PART B — (5 × 13 = 65 marks)

11. (a) Find the current through each resistor in the following Circuit. [Figure 11(a): a 12 V source in series with a 50 ohm resistor feeds a node; from this node a 200 ohm resistor in series with a 10 V source goes to the bottom rail, and a 150 ohm resistor leads to a second node; from the second node a 22 ohm resistor and a 100 ohm resistor are each connected to the bottom rail]

Or

- (b) Discuss about the steady state analysis of RC series circuit and derive the relationships. Draw the phasor diagram.
12. (a) Describe the constructional details of DC motor with relevant diagrams.

Or

- (b) Describe about the construction of working principle of single phase transformer.
13. (a) Explain the construction and operation of JFET and explain about its characteristics.

Or

- (b) Describe the construction, working of BJT. Explain its input and output characteristics.
14. (a) Describe about the hamming code used for error correction and detection in digital data transmission.

Or

- (b) With the help of truth table and simplifying the logic expression, obtain the circuit for half adder.
15. (a) Describe the construction and working of moving coil instrument. Derive the torque equation.

Or

- (b) Describe the construction and working of single phase induction type energy meter.

PART C — (1 × 15 = 15 marks)

16. (a) A coil having a resistance of 10 ohm and an inductance of 0.2 H is connected in series with a 100×10^{-6} F capacitor across a 230 V, 50 Hz supply, Calculate
- (i) The active and reactive components of the current
- (ii) The voltage across the coil, Draw the phasor diagram.

Or

- (b) Minimize the following boolean function using k-map. $F(A, B, C, D) = \sum m(0, 1, 3, 5, 7, 8, 9, 11, 13, 15)$