D **782B3** **Total pages: 2**

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SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FRESHER ODD SEMESTER B.TECH DEGREE EXAMINATION (R), NOVEMBER 2024

Mechanical Engineering

(2024 SCHEME)

Course Code	**:**	**24EST1005-F**
Course Name	**:**	**Basics of Electrical and Electronics Engineering**
Max. Marks	**:**	**60** **Duration:2.5 Hours**

PART I: ELECTRICAL ENGINEERING

Part I to be answered in pages 1 to 15

PART A

(Answer all questions. Each question carries 3 marks)

1. State and explain Kirchoff's voltage and current law.
2. List the types of DC generator.
3. Describe the components of electric vehicle.
4. Draw the phasor diagram of series RLC circuit($V_L > V_C$)

PART B

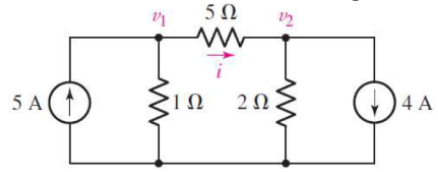
(Answer one full question from each module, each question carries 6 marks)

MODULE I

5. A resistor of 5 Ω is connected in parallel with a resistor of R_1 Ω. This combination is connected in series with an unknown resistor of R_2 Ω and the complete circuit is then connected to 50 V dc supply. Calculate the values of R_1 and R_2, if the power dissipated by the unknown resistor R_1 is 150 W with 5A passing through it. 6

OR

6. Find the current i shown in figure using nodal analysis: 6



MODULE II

7. Explain coefficient of coupling. Derive the expression for the same. 6

OR

8. List and describe the different types of motors and their applications. 6

MODULE III

9. Define the average value of an alternating quantity. Also calculate average value of a sinusoidal current. 6

OR

10. Explain non- conventional energy sources. Describe the various non-conventional energy sources with their advantages and disadvantages. 6

PART II: ELECTRONICS ENGINEERING

Part II to be answered in pages 16 to 30

PART A

(Answer all questions. Each question carries 3 marks)

11. What are the two main types of breakdown in diodes?

12. Describe the function of a transformer in a power supply.

13. What is the principle of operation of Linear Variable Differential Transformer(LVDT)?

14. What is the working principle of solar cell?

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE IV

15. Explain in detail about classification of capacitors. 6

OR

16. a) Derive the relationship between current gain in CE,CC and CB transistor configuration. 3
    b) Given a transistor with $\beta = 50$and $\alpha = 0.9$, calculate the current gain in the common collector configuration. 3

MODULE V

17. a) What is amplitude modulation? Draw the graph and explain. 3
    b) Define modulation index. If the peak amplitude of the modulating signal is 5 V and the peak amplitude of the carrier signal is 20 V, calculate the modulation index (m). 3

OR

18. a) What is the role of the Mobile Switching Center (MSC) in cellular communication? 3
    b) Differentiate soft and hard handoff. 3

MODULE VI

19. Explain the working of a mechanical relay. How relay is connected to control a bulb operating in 230V AC? 6

OR

20. Explain the Seebeck effect and how it relates to the operation of thermocouples. 6

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