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SAINTGITS COLLEGE OF ENGINEERING
KOTTAYAM, KERALA

(AN AUTONOMOUS COLLEGE AFFILIATED TO
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER B.TECH DEGREE EXAMINATION(R), FEBRUARY 2022

Course Code: 20EST130

Course Name: BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Max. Marks: 100 **Duration: 3 Hours**

PART I BASIC ELECTRICAL ENGINEERING

Part I to be answered in pages 1 to 15

PART A

(Answer all questions. Each question carries 4 marks)

1. Four resistors, of ohmic values 5Ω, 10 Ω, 15 Ω, and 20 Ω are connected in series and a 100 V source is applied across the combination. How is this voltage divided among the various resistors?
2. Compare electric and magnetic circuits (give any 4 points).
3. An alternating current is given by $i = 141.4 \sin 314t$. Find (i) the maximum value (ii) frequency (iii) the time period (iv) the instantaneous value when t is 3 ms.
4. The instantaneous voltage and current for an AC circuit are $v = 155.6 \sin 377t$ V and $i = 7.07 \sin (377t - 36.87^o)$ A. Represent these a) as complex exponentials and b) in phasor diagram.
5. Define active, reactive and apparent power. Draw the power triangle.

PART B

(Answer one full question from each module, each question carries 10 marks)

MODULE I

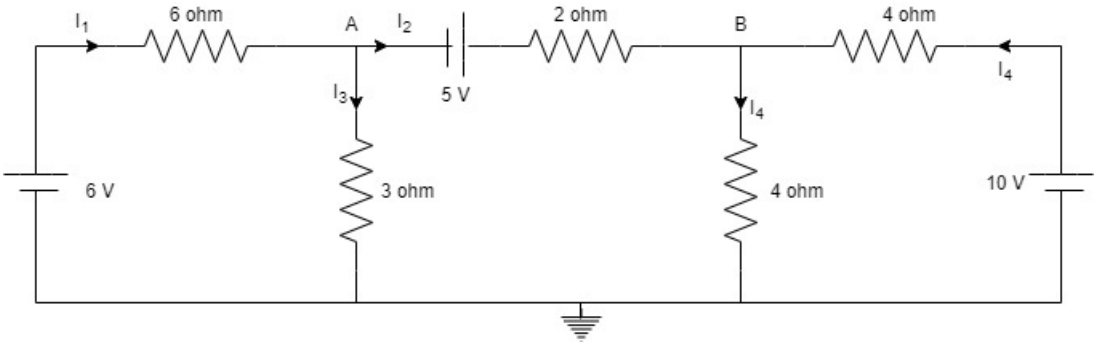
6. a) Three 700 Ω resistors, all in parallel are to be connected to 210 V dc source. It is desired to limit the voltage across these resistors to 110 V by connecting a resistor in series with the parallel combination. Determine (a) the value of resistor, and (b) the total power drawn by the 210 V source. (5)

   b) Three resistances of 20 Ω each are connected in star. Find the equivalent delta resistance. If the source of e.m.f. of 120 V is connected across any two terminals of the equivalent delta connected resistances, find the current supplied by the source. (5)

OR

7. a) State and explain Kirchoff's laws (4)

   b) Using Node voltage analysis, find the branch currents of the following figure. (6)



MODULE II

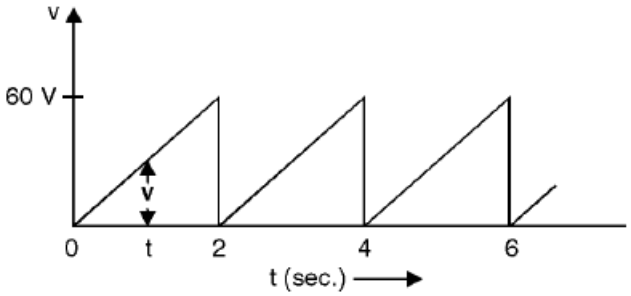
8. a) Define self-inductance, mutual inductance and coefficient of coupling. (5)

b) A resistance 12 Ω, an inductance of 0.15 H and a capacitance of 100 μF are connected in series across a 100 V, 50 Hz supply. Calculate :
(i) The current.
(ii) The phase difference between current and the supply voltage.
(iii) Power consumed. (5)
Draw the vector diagram of supply voltage and the line current.

OR

9. a) Explain the following terms relating alternating current :
(i) R.M.S. value
(ii) Average value
(iii) Form factor. What is the form factor of a square wave (5)

b) Determine the average and effective values of the saw-tooth waveform shown in figure.



(5)

MODULE III

10. a) A series RLC circuit is excited by a 100 V, 79.6 Hz source and has the following data: R =100 Ω, L=1 H, C=5 μF. Calculate (a) the input current, and (b) the voltages across the elements. (8)

b) Define power factor. What will be the power factor for a purely inductive circuit. (2)

OR

11. a) Derive the numerical relationship between line and phase currents for a balanced 3-phase delta-connected load. (8)

b) Write the mathematical equations governing a 3-phase system. (2)

PART II BASIC ELECTRONICS ENGINEERING

Part II to be answered in pages 16 to 30

PART C

(Answer all questions. Each question carries 4 marks)

12. What is meant by avalanche breakdown?

13. Discuss about the principle of operation of a NPN transistor.

14. Explain about the concept of voltage divider biasing.

15. Discuss the working principle of a capacitor filter.

16. What is frequency reuse? Explain why hexagonal cell pattern is preferred over circular and square shapes.

PART D

(Answer one full question from each module, each question carries 10 marks)

MODULE IV

17. a) Differentiate between Carbon composition resistor and Carbon film resistor (5)

    b) Discuss about the input-output characteristics of a BJT when connected in common emitter configuration. (5)

OR

18. a) Draw and explain the block diagram of a dc regulated supply. (5)

    b) Compare the characteristics of a half wave rectifier and full wave rectifier. (5)

MODULE V

19. a) With a neat diagram, illustrate the working of a RC coupled amplifier. (5)

    b) Discuss the role of coupling and bypass capacitors in single stage RC coupled amplifier. (5)

OR

20. a) Illustrate and explain the working of a PA system. (5)

    b) With a neat block diagram, discuss about an electronic instrumentation system. (5)

MODULE VI

21. a) Derive the expression for an amplitude modulated signal. (7)

    b) A modulating signal $m(t)=10\cos(2\pi\times10^3t)$ is amplitude modulated with a carrier signal $c(t)=50\cos(2\pi\times10^5t)$. Calculate the modulation index and bandwidth. (3)

OR

22. Using neat diagrams, illustrate & explain the working of a (10)

    a) Superheterodyne receiver.

    b) Mobile communication system

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