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Question Paper Code : 30146

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Second Semester

Electrical and Electronics Engineering

EE 3251 – ELECTRIC CIRCUIT ANALYSIS

(Common to Electronics and Instrumentation Engineering/
Instrumentation and Control Engineering)

(Regulations 2021)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Find "Req" for the circuit shown in Figure 1.

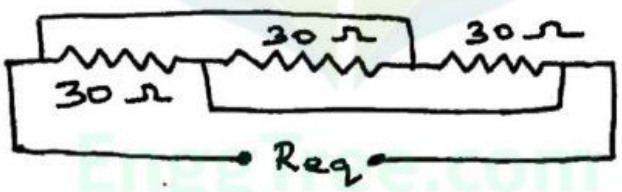

Fig. 1

2. Identify the leading vector and the leading angle from the phasor diagram as shown in Figure 2.

Fig. 2

3. Find the value of 'I' in the circuit shown in Figure 3.

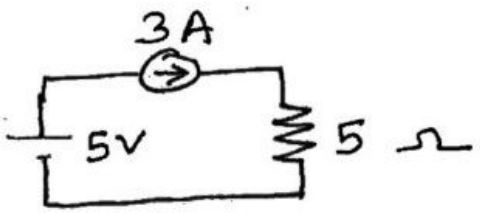

Fig. 3

4. Find the value of 'R_{th}' for the circuit shown in Figure 4. Assume maximum power is transferred to the load.

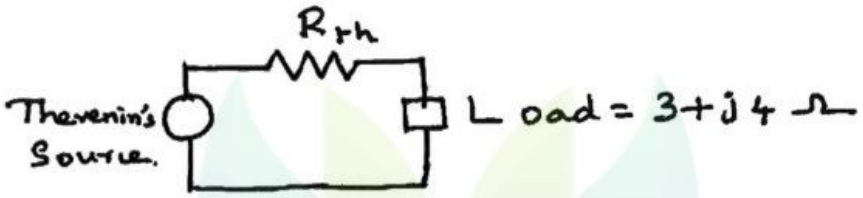

Fig.4

5. Find the time constant for RL and RC series circuit. Assume the circuit is excited with D.C source.

6. A capacitor 'C' is initially charged to a value 'V_c' when it is connected to a D.C. voltage source of value 'V_o'. Calculate $V_c(t)$.

7. In a RLC series circuit, write the expression of the frequency at which the voltage across the capacitor is maximum.

8. Find the expression for the total inductance of the circuit as shown in Figure 5.

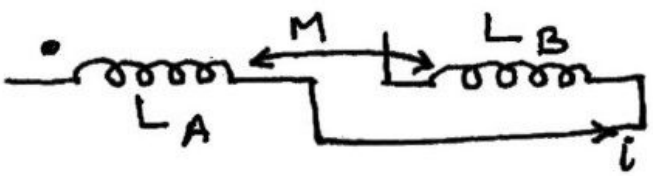

Fig. 5

9. What are the advantages of three phase system?

10. In a two wattmeter measurement system, identify the value of power factor angle for which one of the wattmeter will show zero reading?

PART B — (5 × 13 = 65 marks)

11. (a) Find the value of 'V_o' in the circuit shown in Figure 6. (13)

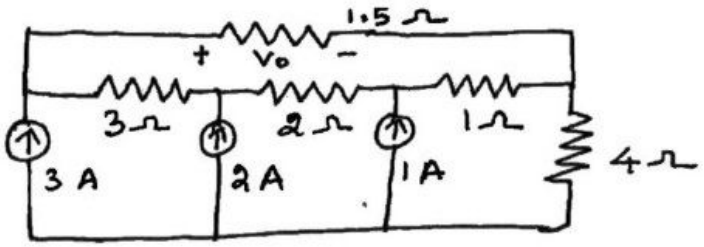

Fig. 6

Or

(b) Find the range of 'R_{in}' for the circuit shown in Figure 7. (13)

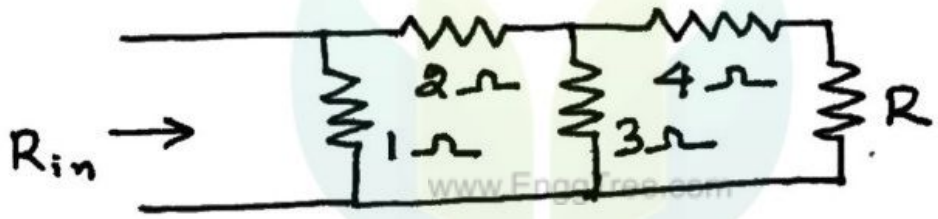

Fig. 7

12. (a) Find the Norton's equivalent across the terminals 'a' and 'b' for the circuit shown in Figure 8. (13)

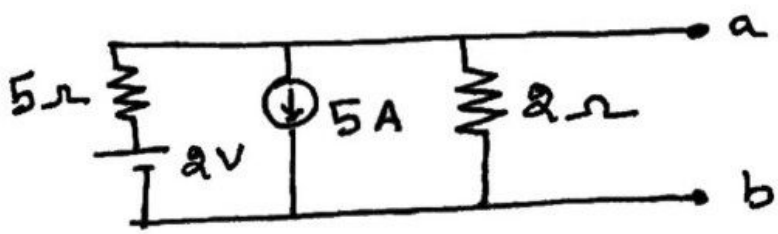

Fig. 8

Or

(b) Find 'v' using superposition theorem for the circuit shown in Figure 9.(13)

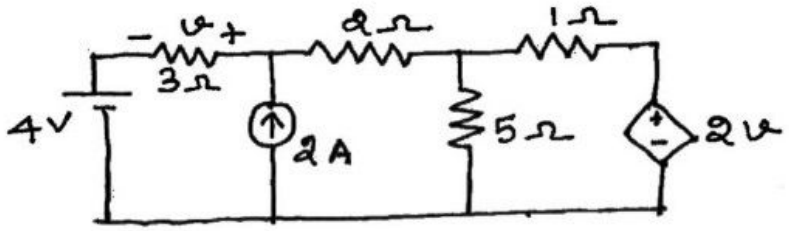

Fig. 9

13. (a) In the circuit shown in Figure 10, the battery voltage is applied for a steady state period. Obtain the complete expression for the current after closing the switch 'K'. (13)

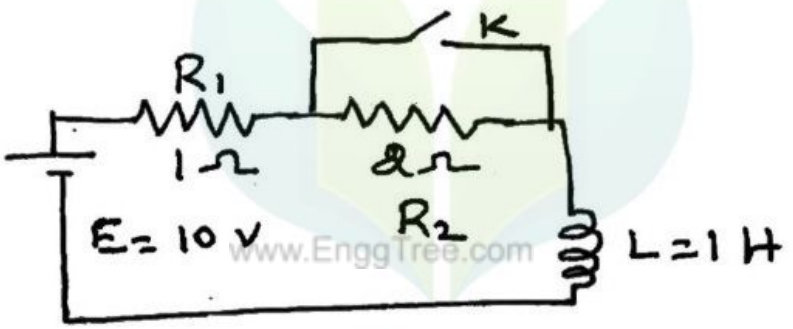

Fig. 10

Or

(b) A capacitor of 5 microfarad is being charged to 10 V is connected to a resistance of 10 kΩ and is allowed to discharge through it by closing a switch 'K'. Find the expression of discharging current. (13)

14. (a) Determine the relationship between the resonance frequency and the half power frequencies of a series resonating circuit. (13)

Or

(b) Following data refers to two coupled coils 1 and 2 (Figure 11). $\Phi_{11} = 0.5$ mWb, $\Phi_{12} = 0.3$ mWb, $N_1 = 100$ turns, $N_2 = 500$ turns; $i_1 = 1\,A$. Find coefficient of coupling, inductances L_1, L_2 and M. (13)

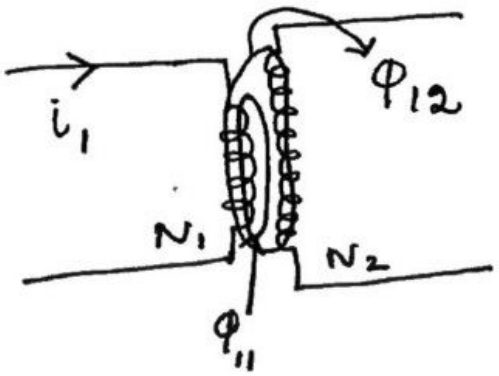

Fig. 11

15. (a) A balanced three phase star connected load is connected across a 11 kV, 50 Hz, three phase supply. If the load consumes 150 kW and takes a leading current of 100 A, find the circuit constants of the load on per phase basis. (13)

Or

(b) Three identical resistances are connected in a star fashion, against a balanced three phase voltage supply. If one of the resistances is removed, calculate the reduction in power. (13)

PART C — (1 × 15 = 15 marks)

16. (a) In the circuit shown in Figure 12, value of all the resistances is 1 Ω Calculate R_{AB}. (15)

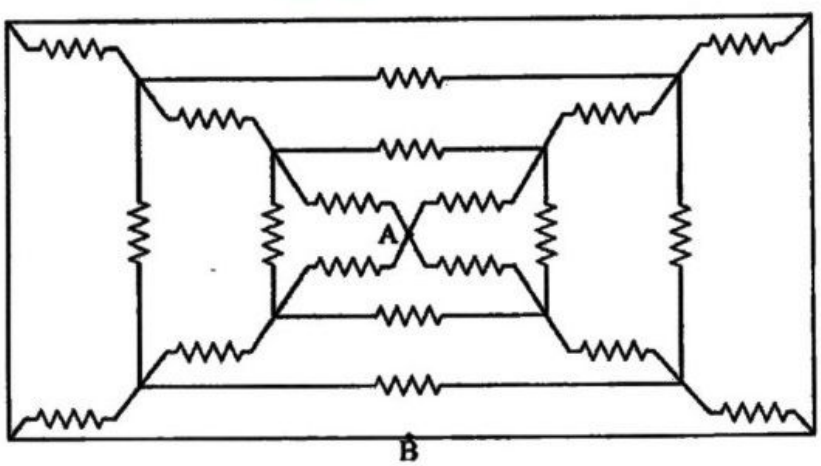

Fig. 12

Or

(b) Find the value of 'R_L' (Figure 13) so that the efficiency of the circuit becomes 50%. (15)

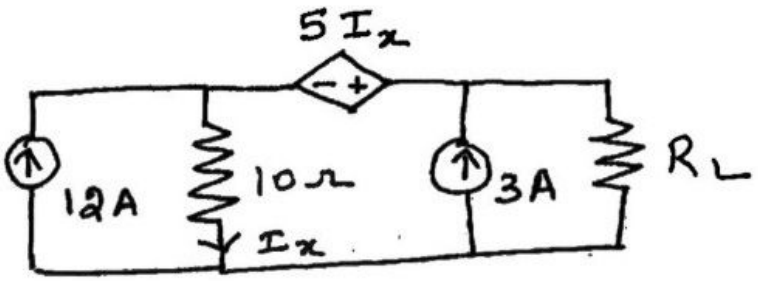

Fig. 13