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Question Paper Code : 80124

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Second Semester

Electrical and Electronics Engineering

EE 8251 — CIRCUIT THEORY

(common to Electronics and Instrumentation Engineering/B.E. Instrumentation and Control Engineering)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Kirchoff's Current law.

2. Find the equivalent resistance of circuit with three resistors connected in series each having a resistance value of 3 Ohms.

3. What is the condition for maximum power transfer in DC circuits?

4. State Thevenin's theorem.

5. Write down the time constant of R-L and R-C circuit.

6. How does an inductor act at $t=0^+$ and $t=\infty$?

7. Define Quality factor.

8. Find the current through the circuit with 5 Ohms resistor across a voltage source of $10\cos(50t - 50^\circ)$ Volts.

9. Mention the expression for resonant frequency in series resonance.

10. Define coefficient of coupling.

PART B — (5 × 13 = 65 marks)

11. (a) Use resistance and source combinations to determine the current i in the Fig 1. And the power delivered by the 80-V source.

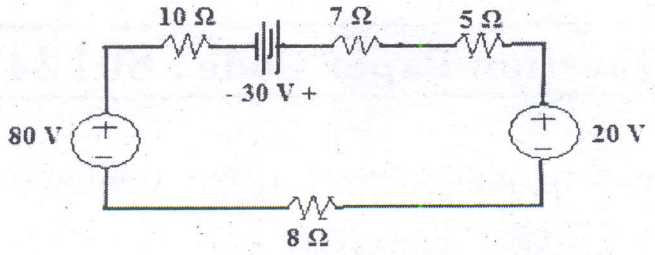

Fig. 1

Or

(b) (i) Find the magnitude of total current (I_T) and also find out current and voltage drop across the resistors as shown in the Fig. 2. Assume $R_1 = 100\Omega$, $R_2 = 20\ \Omega$ and $V = 50V$.

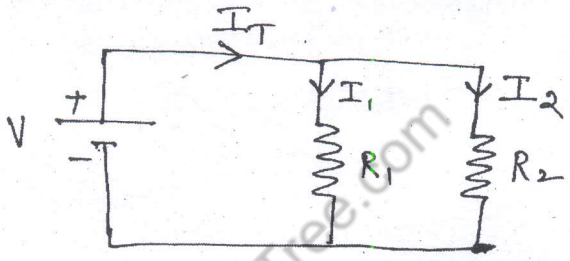

Fig. 2

(ii) Find the voltage across the three resistances shown in the Fig. 3.

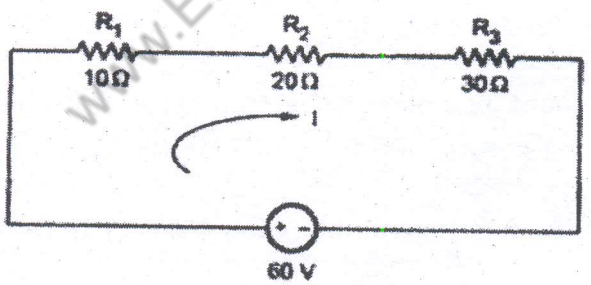

Fig. 3

12. (a) (i) Specify the procedure to solve any given circuit using thevenin theorem.

(ii) Find the Thevenin's Equivalent circuit for the network faced by the 1 KΩ resistor in Fig 4.

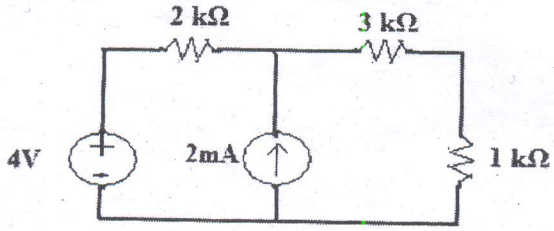

Fig. 4

Or

(b) (i) Specify the procedure to solve any given circuit using Norton theorem.

(ii) Find the Norton Equivalent circuit for the network faced by the 1 KΩ resistor in Fig 5.

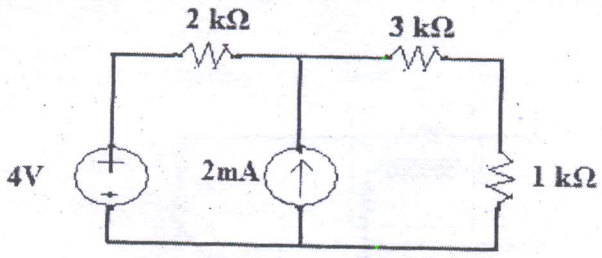

Fig. 5

13. (a) Derive the expressions for a current in a source free RC circuit.

Or

(b) Derive the expressions for a current in a source free RL circuit.

14. (a) (i) Derive the expressions of the phasor relationship for Inductor.

(ii) Find the current flowing through a circuit with a voltage of $8\cos(100t - 50^\circ)$ at a frequency $\omega = 100$ rad/s across a 4 H inductor.

Or

(b) Explicate in detail about the three phase balanced circuits.

15. (a) Derive the expression to obtain the frequency of parallel resonance.

Or

(b) Elucidate the dot convention procedure to obtain the mutual inductance with relevant circuit diagrams.

PART C — (1 × 15 = 15 marks)

(Application/Design/Analysis/Evaluation/Creativity/Case study questions)

16. (a) Calculate the readings of the two wattmeters (W1 and W2) connected to measure the total power for a balanced star-connected load shown in Fig. 6, fed from a three-phase, 400 V balanced supply with phase sequence as R-Y-B. The load impedance per phase is 20+j15. Also find the line and phase currents, power factor, total power, total reactive VA and total VA.

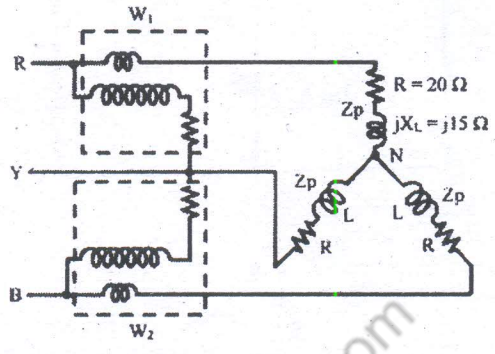

Fig. 6

Or

(b) Calculate the readings of the wattmeter (W) connected as shown in Fig 7. The load is the balanced star-connected one, with impedance of per phase fed from a three-phase, 400 V, balanced supply, with the phase sequence as R-Y-B.

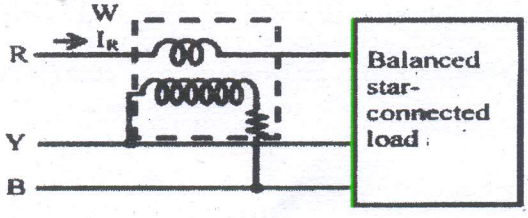

Fig. 7