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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.

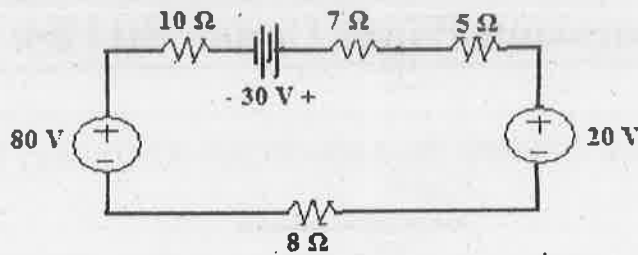


Fig. 1

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 $V = 50V$.

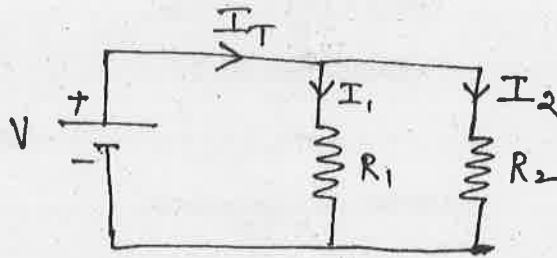


Fig. 2

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

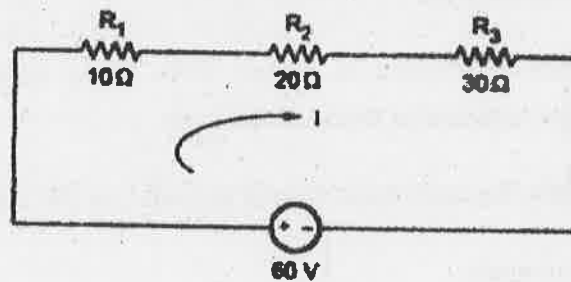


Fig. 3

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.

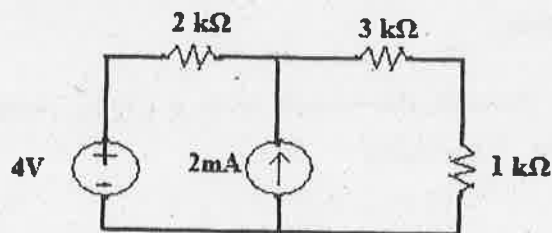


Fig. 4

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 $1\text{ k}\Omega$ resistor in Fig 5.

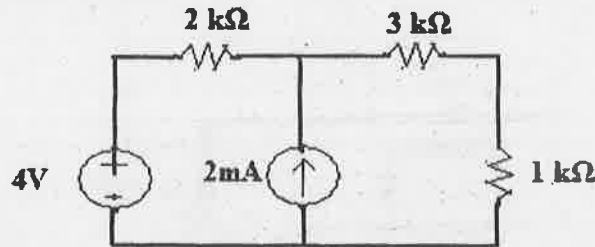


Fig. 5

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 $\omega = 100\text{ rad/s}$ 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 (W_1 and W_2) 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.

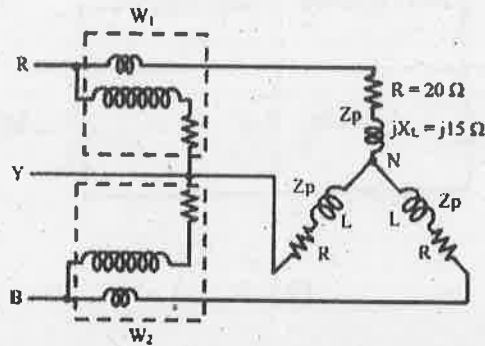


Fig. 6

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.

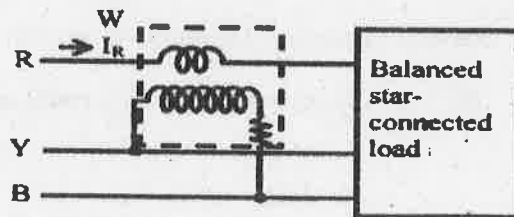


Fig. 7