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Question Paper Code : 11285

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

Second Semester

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Electrical and Electronics Engineering

EE3251 — ELECTRIC CIRCUIT ANALYSIS

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

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

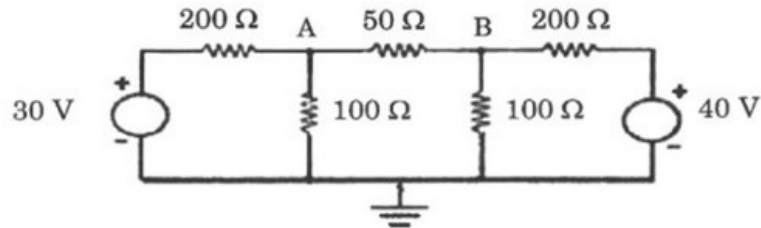
PART A — (10 × 2 = 20 marks)

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1. Two resistors of $4\ \Omega$ and $6\ \Omega$ are connected in parallel with a total current of 5 A. Determine the current through each resistor.
2. Give the relationship between apparent power, average power and reactive power.
3. Convert a current source of 15 A in parallel with a $5\ \Omega$ resistor into its equivalent voltage source.
4. A load is connected to a network with Thevenin resistance of $10\ \Omega$ and Thevenin voltage of 40 V. Determine the maximum power delivered to the load.
5. A DC voltage of 100 V is applied to a series RL circuit with $R = 25\ \Omega$. Determine the current at a time equal to twice the time constant.
6. Calculate the time constant of an RL circuit with $R = 100\ \Omega$ and $L = 20\ \text{mH}$.
7. Determine the maximum possible mutual inductance of two coupled coils with self-inductances of 16 H and 4 H.
8. Compare the behavior of series and parallel resonant circuits under operating conditions.
9. List the different methods of power measurement in three-phase circuits.
10. Compare star and delta connected systems in practical applications.

PART B — ($5 \times 13 = 65$ marks)

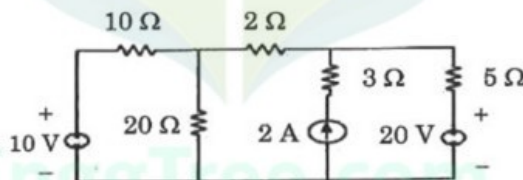
11. (a) Find the current flowing through the $50\ \Omega$ resistor by using Node voltage method.



Or

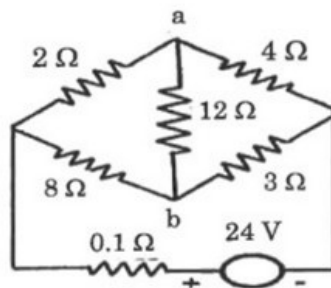
- (b) A load consisting of $40\ \Omega$, $20\ \mu\text{F}$ capacitor and $0.2\ \text{H}$ inductor all connected in series is fed by a voltage source of $220\angle 0^\circ\ \text{V}$. The system frequency is $50\ \text{Hz}$.
- Determine the complex power supplied by the source.
 - Calculate the load power factor
 - Find the real and reactive power consumed by the resistor, the capacitor and the inductor and check the power balance.

12. (a) Find the voltage across the $2\ \Omega$ resistor by using super position theorem in figure.

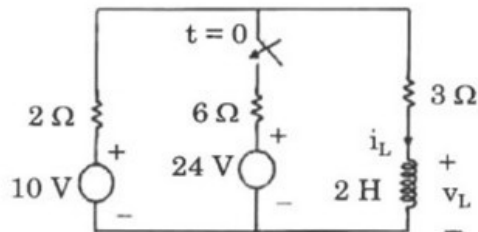


Or

- (b) Applying Thevenin's theorem, determine current I_{ab} in the circuit shown in figure.



13. (a) For the circuit shown in figure, find the current $i_L(t)$ and voltage $v_L(t)$ for time $t > 0$ and Sketch the wave forms. Also find the time at which the current $i_L(t)$ becomes 2.5 A and the voltage $v_L(t)$ becomes 2 V.

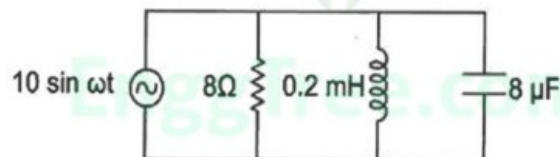


Or

- (b) Analyze the transient response of a series RLC circuit with $R = 5\ \Omega$, $L = 0.1\text{ H}$, and $C = 500\ \mu\text{F}$ when a DC voltage of 100 V is suddenly applied at $t = 0$. Determine the expression for the resulting current.
14. (a) Two inductively coupled coils have self inductance $L_1 = 30\text{ mH}$ and $L_2 = 100\text{ mH}$. If the coefficient of coupling is 0.5
- Find the value of mutual inductance between the coils
 - What is the maximum possible mutual inductance?

Or

- (b) In the parallel RLC circuit in Figure, Calculate resonant frequency, bandwidth and Q factor



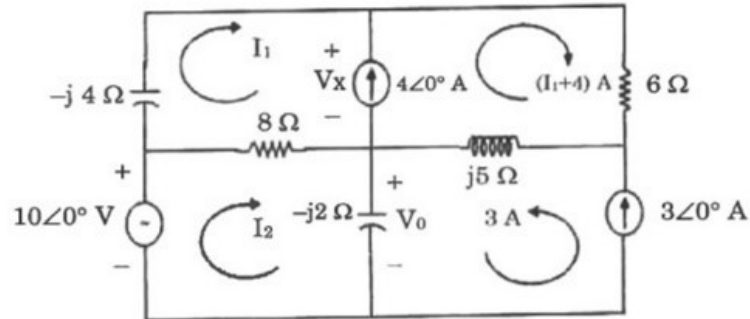
15. (a) A three phase 4-wire system, 208 V has a star - connected load with impedances $Z_A = 6\angle 0^\circ\ \Omega$, $Z_B = 6\angle 30^\circ\ \Omega$, and $Z_C = 5\angle 45^\circ\ \Omega$. Taking voltage V_{BN} as reference, determine the line and neutral currents. Draw the phasor diagram.

Or

- (b) The two wattmeter produces wattmeter readings $P_1 = 1560\text{ W}$ and $P_2 = 2100\text{ W}$ when connected to delta connected load. If the line voltage is 220 V, Calculate (i) the per phase average power (ii) total reactive power (iii) power factor (iv) the phasor impedance. Is the impedance inductive or capacitive?

PART C — (1 × 15 = 15 marks)

16. (a) Using mesh analysis, find the voltage V_0 in the circuit shown in figure



Or

- (b) Determine the maximum real power delivered to the load impedance Z_L in the circuit shown in figure.

