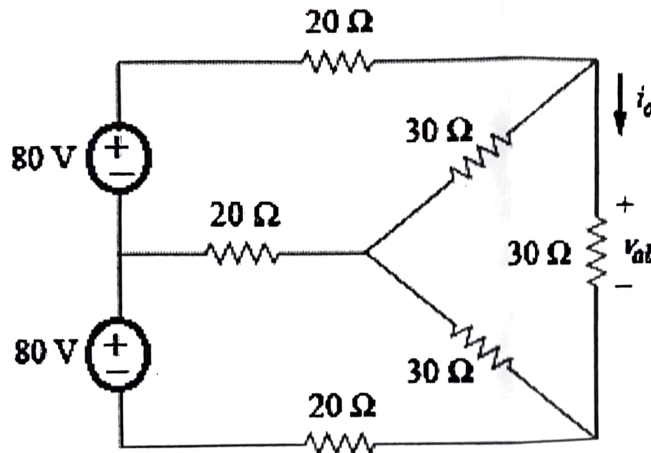




- **KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAMINATION MALPRACTICE**
- **DON'T WRITE ANYTHING ON THE QUESTION PAPER**

Answer ALL Questions
(10 X 10 = 100 Marks)

1. Determine the current in all the loops and V_{ab} for the given circuit shown in Fig.1 using Mesh analysis.



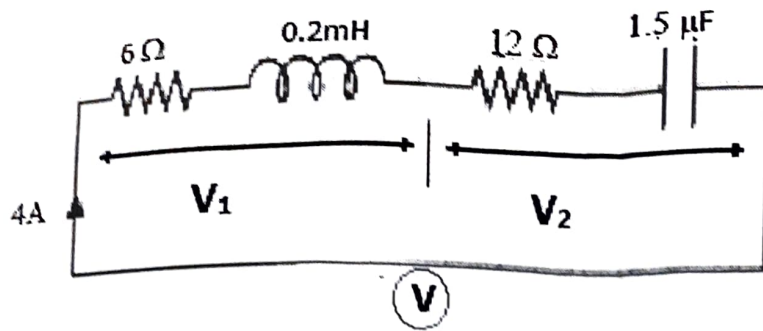


Fig.3

4. Three identical coils with resistance $5\ \Omega$ and inductance $40\ \text{mH}$ are connected (a) in star and (b) in delta to a $415\ \text{V}$, $50\ \text{Hz}$, 3-phase supply. Calculate (i) line and phase voltage (ii) line and phase current (iii) power factor (iv) power dissipated in star and delta connection.
5. Explain the construction and working principle of transformer with necessary diagram.
6. With a neat sketch, explain the working principle of a stepper motor. Mention any four applications of the stepper motor.
7. In an analog communication system, a modulator with amplitude variation has two inputs. One signal has the peak amplitude of $7.5\ \text{V}$ and $10\ \text{kHz}$ frequency. Second signal is defined with the magnitude of $20\ \text{V}$ peak value and $500\ \text{kHz}$ frequency. Determine,
 - i) Modulated signal expression in time domain
 - ii) Depth of modulation in percentage
 - iii) Number of spectral components and its magnitude
 - iv) Frequency domain representation of modulated signal in graphical form
 - v) Bandwidth required
8. Design Full Subtractor circuit by consider the input as x , y and z . Determine,
 - i) Truth table
 - ii) Boolean expression for the difference output (D) and borrow output (B)
 - iii) Logic circuit for full subtractor using NAND Gates only

- 9.(a) Explain the characteristics of a Silicon PN junction diode after briefing its construction with neat sketch.

OR

- 9.(b) Explain the configurations and operating principles of BJT with necessary diagram.
- 10.(a) Consider a conveyor belt control system with four sensors inputs (A, B, C, and D) positioned at various conveyor stages and M represent the motor output indicator. Construct a logic circuit for a conveyor belt control system. The acceptable behavior is, the motor (M) should be ON when exactly one sensor is active. Create a truth table for the given condition. Also, derive an expressions for M using Karnaugh maps (K-map) and sketch the logic circuit for minimized expression using basic gates.

OR

- 10.(b) Given the Boolean function

$$F = xy'z + x'y'z + w'xy + wx'y + wxy$$

- i) Obtain the truth table of the function and mention the minterms for the same.
- ii) Simplify the function to a minimum number of literals using Boolean algebra.
- iii) Obtain the logic circuit for the minimized expression using basic gates.

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