

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 1 – EXAMINATION – SUMMER 2026

Subject Code: 3110005

Date: 07/07/2026

Subject Name: Basic Electrical Engineering

Time: 10:30 AM TO 01:00 PM

Total Marks: 70

Instructions:

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**
- 4. Simple and non-programmable scientific calculators are allowed.**

- Q.1** (a) Define ideal current and ideal voltage source. State the difference between an Ideal and practical voltage source. **03**
- (b) What is power factor? List different methods of power factor improvement. **04**
- (c) Define following: (1) Average value (2) Maximum value (3) Frequency (4) Resonance (5) Form factor (6) Time period (7) Phase sequence **07**
- Q.2** (a) A single-phase R–L circuit has $R=10\ \Omega$, $L=0.1\ \text{H}$, supplied by 230 V, 50 Hz. Calculate current, inductive reactance and impedance. **03**
- (b) List the main parts of a single-phase transformer. **04**
- (c) Explain the construction and working of a three-phase induction motor with neat diagram. Also state the role of slip in its operation. **07**
- OR
- Q.2** (c) Explain the construction and working of a single-phase induction motor with neat diagram. Why is it not self-starting? **07**
- Q.3** (a) Write short notes on plate earthing. **03**
- (b) Compare mesh analysis with nodal analysis. Analyze which method is more suitable for circuits with more voltage sources. **04**
- (c) Explain the construction and working principle of ELCB with necessary diagram. **07**
- OR
- Q.3** (a) Differentiate between primary and secondary batteries. **03**
- (b) Two RL circuits have the same inductance but different resistances: Circuit A: $R=2\ \Omega$, Circuit B: $R=10\ \Omega$. Compare their time constants. Analyze which circuit responds faster and justify. **04**
- (c) Explain the construction and working principle of MCB with necessary diagram. **07**
- Q.4** (a) List the main parts of a separately excited DC motor. **03**
- (b) State the working principle and EMF equation of the transformer. Define Turns ratio. **04**
- (c) Derive condition $X_L=X_C$ in series RLC resonance. Explain why impedance is minimum. Draw and analyze: variation of current vs frequency, variation of impedance vs frequency, Identify resonance point. **07**
- OR
- Q.4** (a) List the main parts of a synchronous generator. **03**
- (b) Identify the primary difference between a step-up and a step-down transformer in terms of their turn ratios. State which winding (primary or secondary) has thicker wire in a step-down transformer. **04**

- (c) A balanced 3-phase, 3-wire load is supplied with a line voltage of 400 V. The readings of two wattmeter connected by the two-wattmeter method are: $W_1=5$ kW, $W_2=1$ kW. Determine: Power factor of the load, Nature of power factor (lagging or leading), Phase angle of the load. 07

- Q.5** (a) Explain in brief construction of single phase transformer with neat diagram. 03
 (b) A balanced load is connected first in star and then in delta across the same supply. Compare line current in both cases. Analyze power consumption in both connections. 04
 (c) Using the Superposition Theorem, find the current through the $6\ \Omega$ resistor in the given circuit. 07

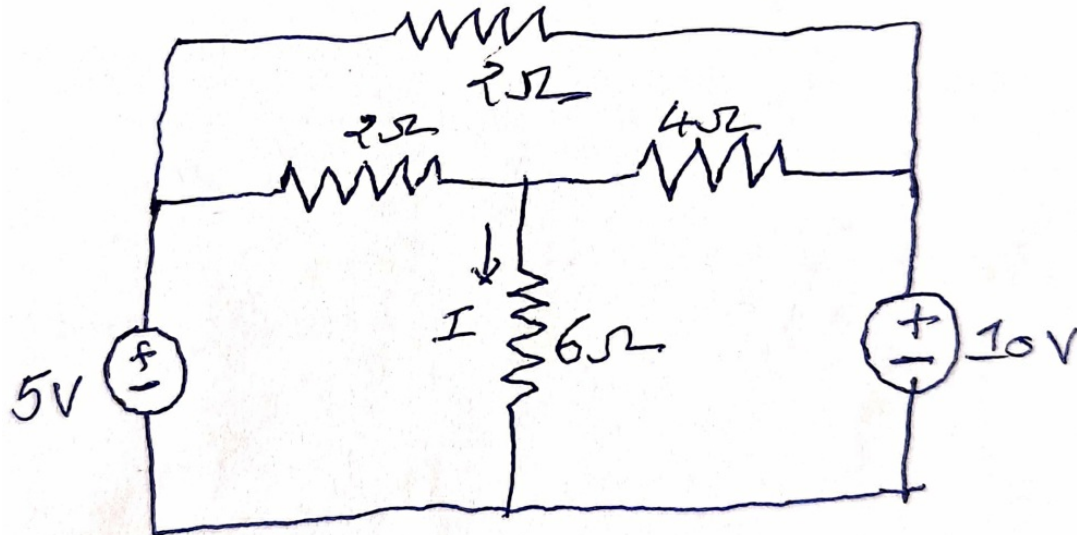


fig. 01

OR

- Q.5** (a) Explain autotransformer in brief and describe the primary structural difference between the autotransformer and normal transformer. 03
 (b) A balanced star-connected load has: $V_L=400$ V, $Z_{ph}=10+j5\ \Omega$. Calculate phase voltage, phase and line current, power factor, total power. 04
 (c) Using Thevenin's Theorem, find the current through the load resistor $R_L=3\ \Omega$ for the given circuit. 07

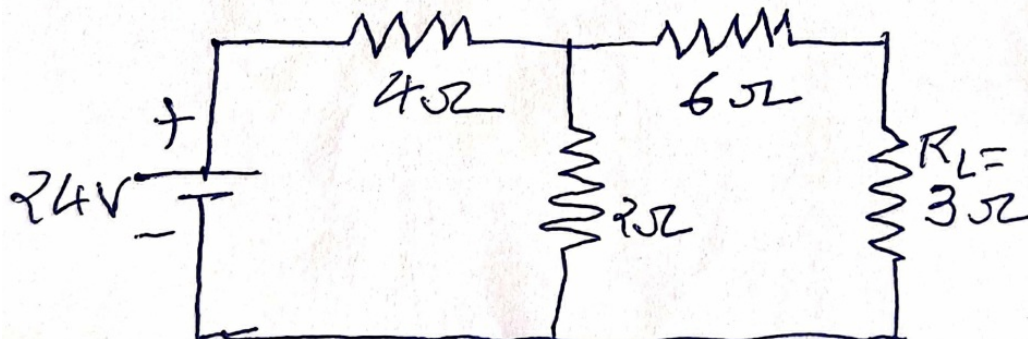


fig. 02
