

F.Y. B.Tech.  
ELEMENTS OF ELECTRICAL ENGINEERING (EE101)

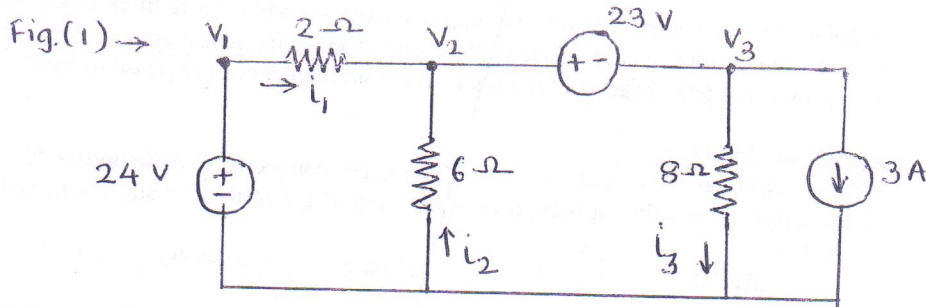
[Time: 3 Hours]

[Max. Marks: 60]

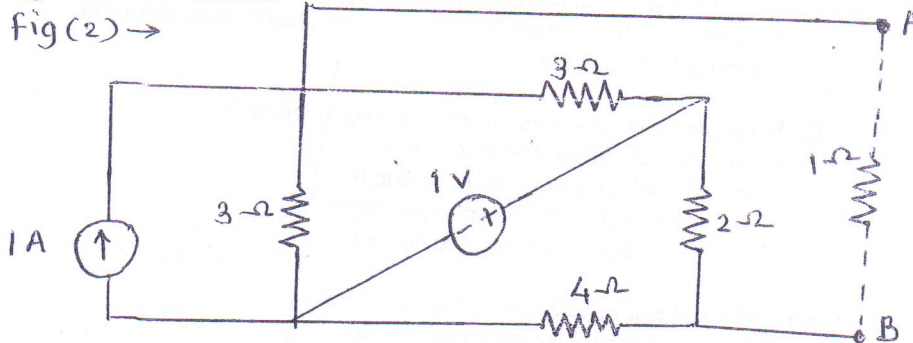
Instructions to candidates:

- 1) Answer any FOUR questions.
- 2) Neat Diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of logarithmic tables, mollier charts, non-programmable electronic calculators and steam tables are allowed.

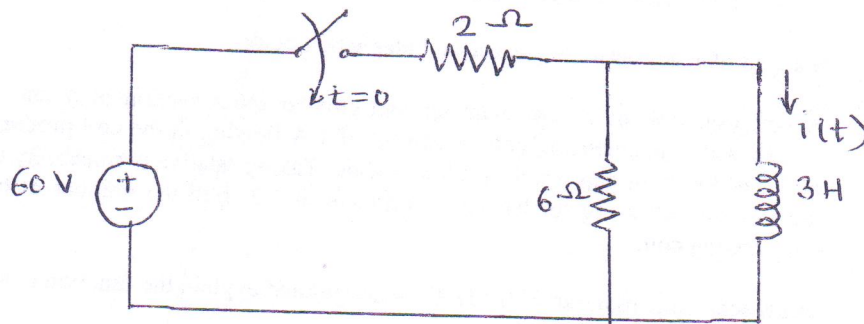
- Q.1    a    State and explain Superposition Theorem. 3
- b    Determine the variables indicated in Fig (1) using nodal analysis. 6



- c    Determine the current through 1 ohm resistance across terminals A and B in Fig (2) using Thevenin's Theorem. 6



- Q.2    a    i) What are the factors affecting the resistance of the material. Define RTC. 3  
        ii) Define independent current sources and independent voltage sources. 2
- b    Derive the expression for energy stored in the inductor. 5
- c    For the Fig. (3) shown, find  $i(t)$  after the switch is closed at  $t=0$  and sketch it. 5



- Q.3 a Define R.M.S. value and form factor of the alternating current 3
- b With the help of waveforms and phasor diagrams, comment on the phase relationship between the voltage and the current in pure resistive, pure inductive and pure capacitive circuits. 6
- c A coil of power factor 0.6 is in series with a  $100 \mu\text{F}$  capacitor. When connected to a 50 Hz supply, the potential difference across the coil is equal to the potential difference across the capacitor. Find the resistance and inductance of the coil. 6
- Q.4 a For the star and delta connected loads, state numerical relationship between i) Line current and phase current ii) Line voltage and phase voltage. Also state the expression for power in terms of line voltage, line current and power factor. 4
- b A balanced star-connected load is supplied from a symmetrical three-phase 415 V system. The current in each phase is  $20 \angle -30^\circ$ . Determine phase voltage, line current, total power and power factor of the load. Also find impedance per phase of load. 6
- c Answer the following: 5
- i) Three identical resistances, each of 15 ohm, are connected in delta across 400 V, 3-phase supply. The value of resistance in each leg of the equivalent star-connected load would be----
- a)  $15 \Omega$       b)  $7.5 \Omega$       c) 5 ohm      d) 30ohm
- ii) An electric fan and a heater are marked as 100 W, 220 V and 1000 W, 220 V respectively. The resistance of heater is -----
- a) zero      b) less than that of fan      c) greater than that of fan  
d) equal to that of fan
- iii) Magnetic field inside the current carrying solenoid is ----
- a) directly proportional to current  
b) directly proportional to its length  
c) inversely proportional to its length  
d) inversely proportional to current.
- iv) Hysteresis loss can be reduced by-----
- a) laminating the magnetic circuit  
b) using material with narrow hysteresis loop  
c) increasing mmf of the circuit.  
d) None of the above
- v) Due to fringing at the air gaps in a magnetic circuit, the effective area of the air gap is ----
- a) increased    b) decreased    c) remains same    d) None of the above
- Q.5 a State similarities between electric and magnetic circuits. 3
- b A soft iron ring of 25 cm diameter and circular cross section of 5 cm diameter is wound with a magnetising coil. A current of 4 A flowing in the coil produces the flux of 2.5 mWb in air gap which is 2.5 mm wide. Taking relative permeability of 1000 for the iron and allowing for leakage coefficient of 1.2, find the number of turns of the magnetising coil. 6
- c Draw schematic diagram of the D. C. generator and explain the function of each part. 6