Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 57018

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Second Semester

Electrical and Electronics Engineering

EE 6201 — CIRCUIT THEORY

(Common to Electronics and Communication Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Biomedical Engineering and Medical Electronics Engineering)

(Regulation 2013)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Find the equivalent resistance of the circuit shown in Fig.1.

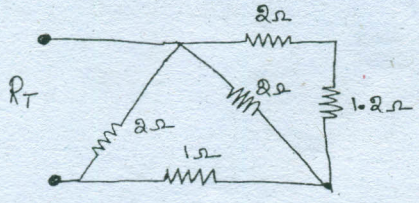

Fig.1

2. Define RMS voltage.
3. What is reciprocity theorem?
4. Why do you short circuit the voltage source and open the current source when you find Thevenin's voltage of a Network?
5. Define quality factor in the resonant circuit.
6. Determine the quality factor of a coil for the series resonant circuit consisting of R = 10 ohm, L = 0.1H, and C = 10 microfarad.
7. Distinguish between natural and forced response.
8. What is the time constant for RL and RC circuit?
9. Write the effect of power factor in energy consumption billing.
10. Distinguish between unbalanced source and unbalanced load.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Find the current I and voltage across 30Ω of the circuit shown in Fig.11 (a) (i). (8)

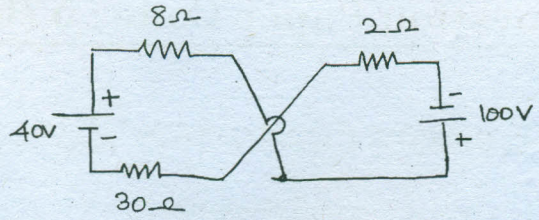

Fig. 11 (a) (i)

(ii) Determine, the current in all the resistors of the circuit shown in Fig. 11 (a) (ii) (8)

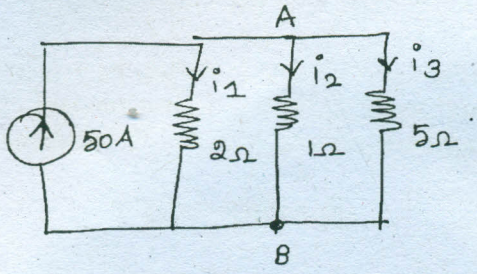

Fig. 11 (a) (ii)

Or

(b) (i) Determine the current through each resistor in the circuit shown in Fig 11 (b) (i). (6)

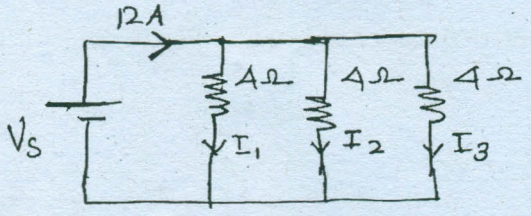

Fig 11 (b) (i)

(ii) When a dc voltage is applied to a capacitor, voltage across its terminals is found to build up in accordance with $v_c = 50\left(1 - e^{-100t}\right)$. After 0.01 S the current flow is equal to 2 mA.

(1) Find the value of capacitance in farad.

(2) How much energy stored in the electric field? (10)

12. (a) (i) Determine the current in the 5Ω resistor in the network shown in Fig. 12 (a) (i). (8)

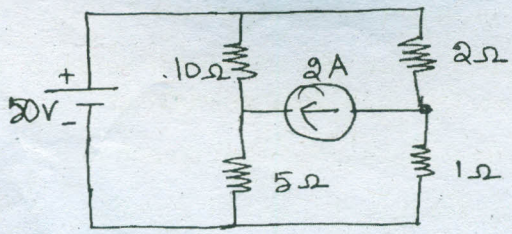

Fig. 12 (a) (i)

(ii) Find out the current in each branch of the circuit shown in Fig. 12 (a) (ii). (8)

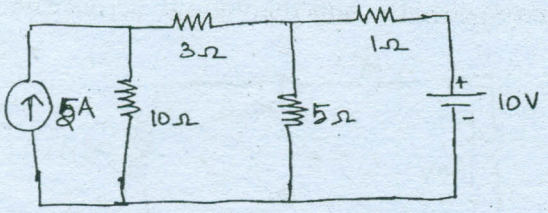

Fig. 12 (a) (ii)

Or

(b) (i) Determine current in each mesh of the circuit shown in Fig. 12 (b) (i). (8)

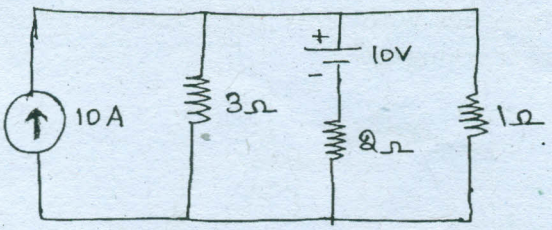

Fig. 12 (b) (i)

(ii) Determine the voltages at each node of the circuit shown in Fig. 12 (b) (ii). (8)

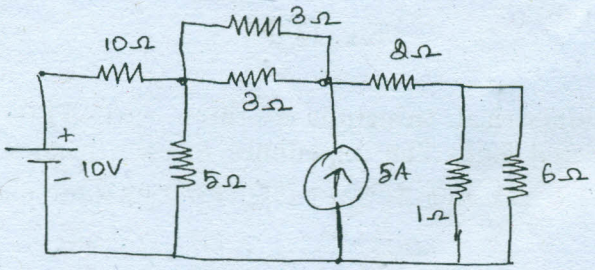

Fig. 12 (b) (ii)

13. (a) For the circuit shown in Fig. 13 (a), determine the impedance at resonant frequency, 10Hz above resonant frequency, and 10Hz below resonant frequency. (16)

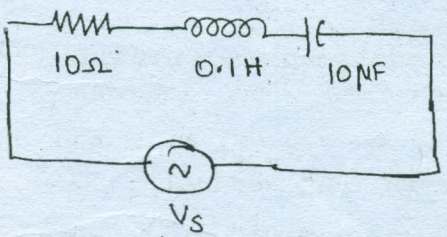

Fig. 13 (a)

Or

(b) Explain that how to derive Q factor of parallel resonance. (16)

14. (a) A series RL circuit with $R = 30\Omega$ and $L = 15H$ has a constant votlage V = 60v applied at $t = 0$ as shown in Fig. 14 (a). Determine the current i, the voltage across resistor and the voltage across the inductor. (16)

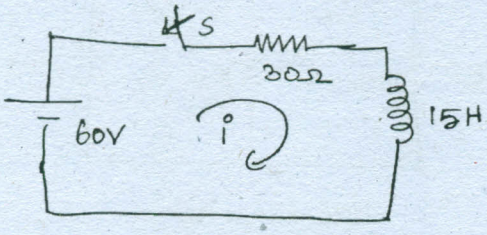

Fig. 14 (a)

Or

(b) The circuit shown in Fig. 14 (b) consists of resistance, inductance and capacitance in series with 100V DC when the switch is closed at $t = 0$. Find the current transient. (16)

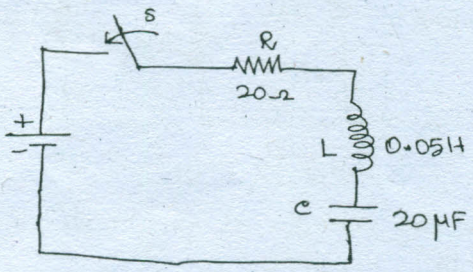

Fig. 14 (b)

15. (a) (i) A symmetrical three-phase; three wire 440V supply to a star connected load. The impedance in each branch are $Z_R = 2 + j3\Omega$, $Z_Y = 1 - j2\Omega$ and $Z_B = 3 + j4\Omega$. Find its equivalent delta connected load. (8)

(ii) A three phase, balanced delta-connected load of $4 + j8\Omega$ is connected across a 400V, 3ϕ balanced supply. Determine the phase currents and line currents. (Phase sequence is RYB). (8)

Or

(b) (i) A symmetrical three-phase, three wire 400V, supply is connected to a delta-connected load. Impedances in each branch are $Z_{RY} = 10\angle 30^\circ\ \Omega$, $Z_{YB} = 10\angle 45^\circ\ \Omega$ and $Z_{BR} = 2.5\angle 60^\circ\ \Omega$. Find its equivalent star- connected load. (8)

(ii) A balanced star connected load having an impedance $15 + j20\Omega$ per phase is connected to 3ϕ, 440V, 50HZ. Find the line current and power absorbed by the load. (8)