Reg. No.										

MANIPAL UNIVERSITY

THIRD SEMESTER B.S. (ENGG.) DEGREE EXAMINATION – DECEMBER 2015

SUBJECT: D.C. AND A.C. CIRCUIT ANALYSIS (EE 232)

(BRANCH: MECHANICAL/IP)

Wednesday, December 16, 2015

Time: 10:00 -13:00 Hrs. Max. Marks: 100

✍ **Answer any TEN full questions.**

1. Determine the resistance between terminals of the network shown in Fig Q.1, using star Delta transformation.

(10 marks)

2. In the network shown in Fig Q.2 determine the current in each battery and in the 6 ohm resistor using KVL.

(10 marks)

3. Find the currents I_1, I_2 and I_3 and the voltages V_a and V_b in the network shown in Fig Q.3 using KCL.

(10 marks)

4. Using source transformation and mesh current analysis write down equations for I_1 and I_2 and put them in matrix form. Also determine I_1 *and* I_2 shown in Fig Q.4.

(10 marks)

5. With relevant waveforms prove that a pure inductor in an a.c circuit consumes zero power.

(10 marks)

6. In Fig Q.6 the capacitor C has a capacitance of 25.5μF. The current flowing through the circuit is 0.4A. The voltage across different parameters of the circuit are as indicated in the diagram. Find the following for the circuit:
   i) Frequency of the applied voltage
   ii) Parameters of iron-cored choke coil
   iii) Applied voltage

(10 marks)

7. State Thevenin's theorem. Find the Thevenin equivalent network of the circuit shown in Fig Q.7.

(10 marks)

8. State and prove maximum power transfer theorem as applicable to a.c circuit with thevenin equivalent source V_{th}, thevenin equivalent impedance Z_{th} and load impedance Z_L (variable). Also derive the maximum power across Z_L.

(10 marks)

9A. State and explain Superposition theorem.

9B. Using superposition determine the current in 2 ohm resistor connected between A and B in the circuit shown in fig Q. 9.

(3+7 = 10 marks)

10. A 23mH inductive coil has a resistance of 10 ohm.

10A. How much current will it draw if connected across a 230V, 50Hz source?

10B. What is the powerfactor of the coil?

10C. Determine the value of capacitance that must be connected across the coil to make the powerfactor of the overall circuit unity.

(10 marks)

11A. State and explain Norton's theorem.

11B. Determine Norton's equivalent across A and B for the circuit shown in fig Q.11.

(3+7 = 10 marks)

12. Three inductive coils (Fig Q.12), each with a resistance of 15 ohm and an inductance of 0.03H are connected i) in star and ii) in delta, to a three phase, 400V, 50Hz supply. Calculate for each of the above case:

i) Phase current and line current

ii) Total power absorbed

(10 marks)

13. In a three phase system with balanced load, power is measured using two wattmeters (W_1 and W_2). Draw the phasor diagram for measurement of power and obtain the powerfactor for the circuit in terms of W_1 and W_2.

(10 marks)

14. Explain what is meant by current resonance. Obtain the expression for resonant frequency f_0 and current magnification for the circuit shown in fig Q.14.

(10 marks)

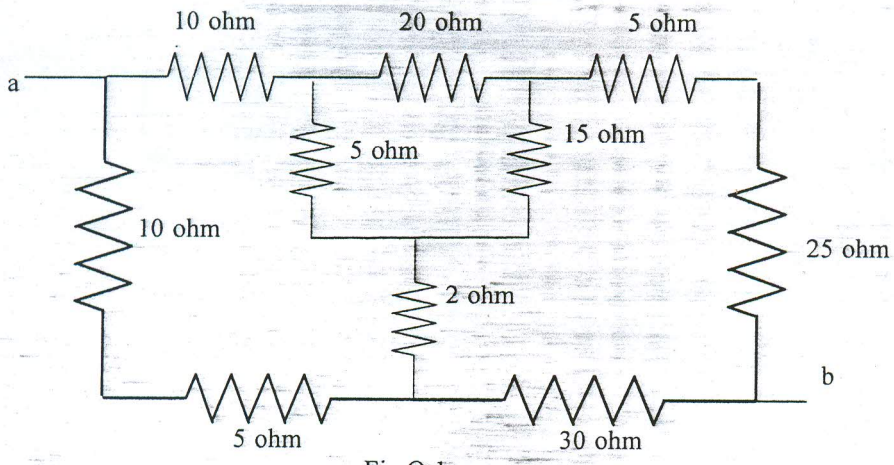

Fig Q.1

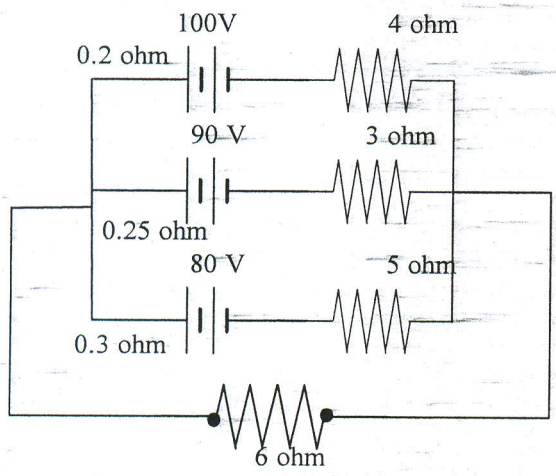

Fig Q.2

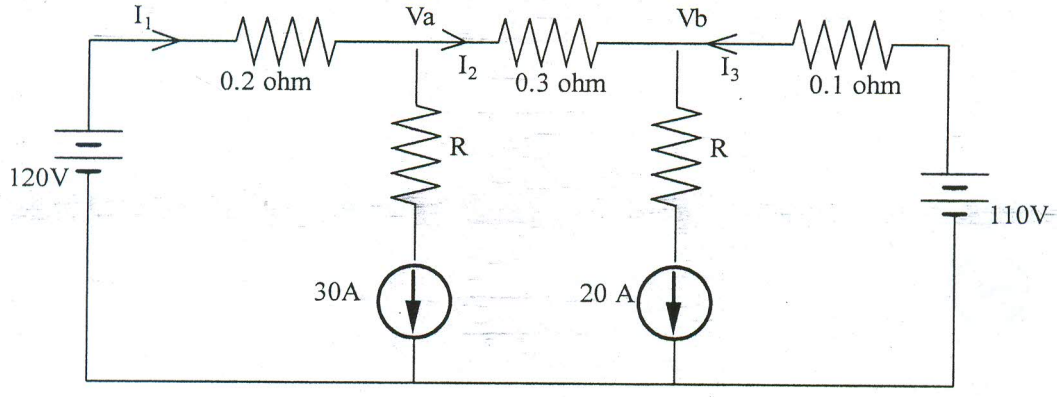

Fig Q.3

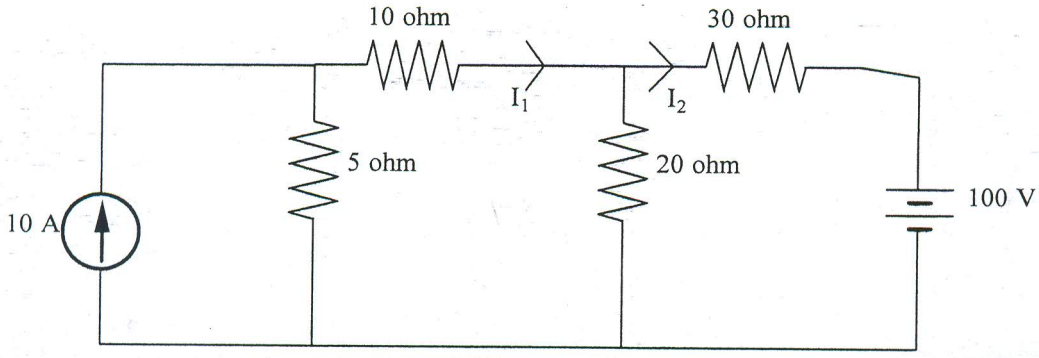

Fig Q.4

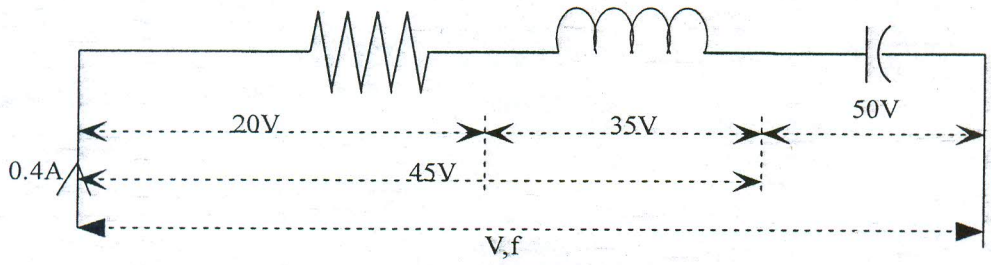

Fig Q.6

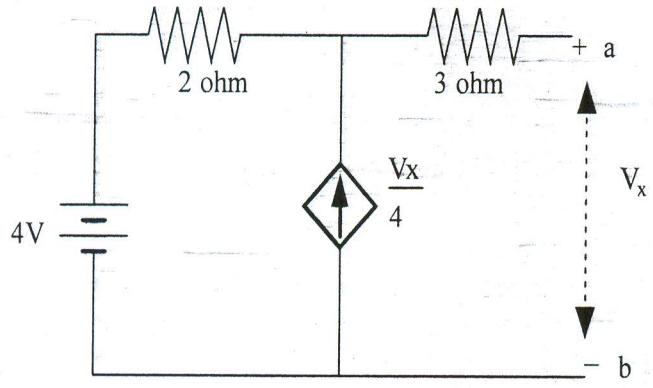

Fig Q.7

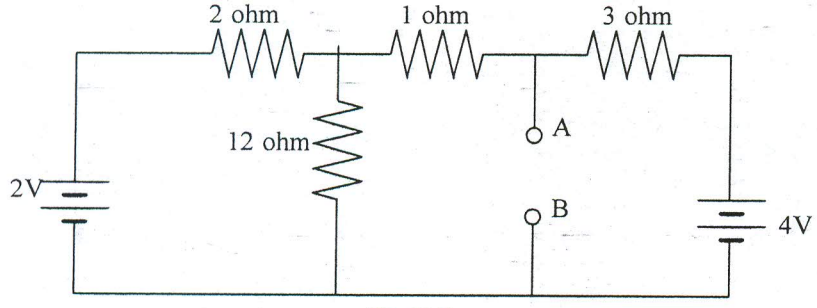

Fig Q.9

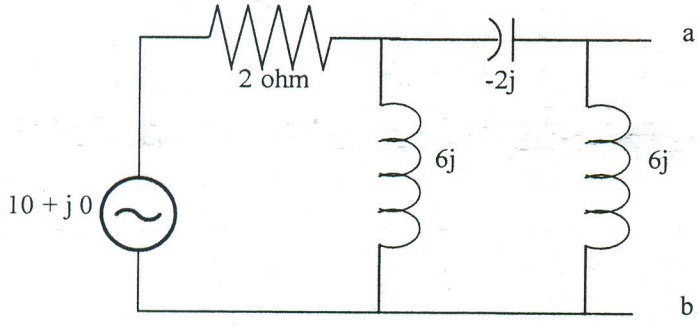

Fig Q.11

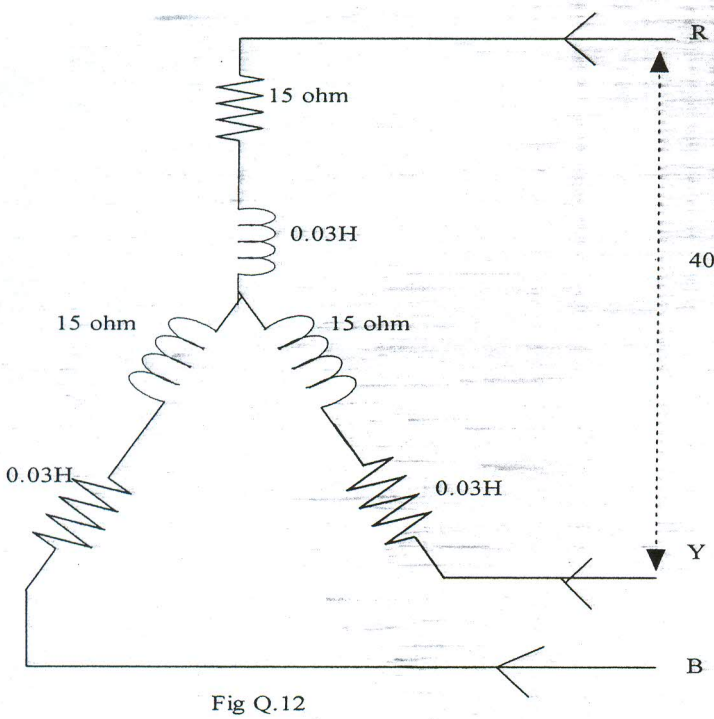

Fig Q.12

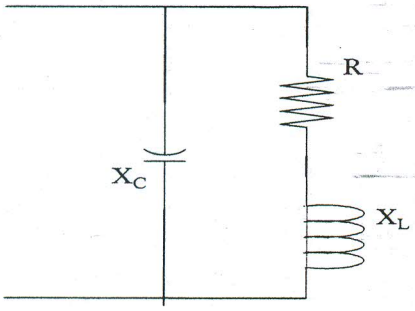

Fig. Q.14