Reg. No.										

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

II SEMESTER B.S. DEGREE EXAMINATION – NOV. / DEC. 2016

SUBJECT: LINEAR NETWORKS IN STEADY STATE ANALYSIS (EE 121)

(BRANCH: CE, E&C, E&E and BM)

Monday, 12 December 2016

Time: 3 Hours **Max. Marks: 100**

✓ **Answer ANY FIVE FULL Questions.**

1. A) For the circuit shown in Fig. Q1A, determine the equivalent resistance between A and B using network reduction technique.

   B) In the network of Fig. Q1B, find the current in 5Ω resistor using mesh current analysis.

   (10+10)

2. A) In the circuit shown in Fig. Q2A, find the current through 8Ω resistor by source transformation method.

   B) In the network of Fig. Q2B, find the current through 8Ω resistor using node voltage method.

   (10+10)

3. A) Starting from fundamentals, show that the current lags behind the voltage by 90^o in a pure inductor. Deduce the value of average power consumed by the inductor. Also, draw the waveforms of voltage, current and power.

   B) In the circuit of Fig. Q3B, determine the (i) total current drawn (ii) current in each impedance (iii) power consumed.

   (10+10)

4. A) A 10Ω resistor is connected in series with a 100μF capacitor across a 230V, 50 Hz single phase, AC supply. Find (i) impedance (ii) current drawn (iii) power factor (iv) power consumed (v) Apparent power

   B) A coil in series with an 8 Ω resistor is connected across a 100V, 50Hz, single phase AC supply. The voltage drop across the coil is 45V and that across the resistor is 80V. Determine the resistance and inductance of the coil.

   C) In the network of Fig. Q4C, determine the current through the inductor using node voltage analysis.

   (5+8+7)

5. A) In the circuit shown in Fig. Q5A, find the power consumed in 5Ω resistor using Thevenin's theorem.

   B) In the circuit of Fig. Q5B, find the voltage V_X and hence verify Reciprocity theorem.

   (10+10)

6. A) In the network of Fig. Q6A, find the voltage across 20Ω resistor using Superposition theorem.

   B) With neat circuit diagram and phasor diagram, deduce the relation between line and phase values of voltage and currents in a balanced, 3 phase, star connected load.

(10+10)

7. A) A two branch parallel circuit has $R_C = 6\ \Omega$ in series with $X_C = 8\ \Omega$ in one branch and $X_L = 6.2\ \Omega$ in series with a variable resistance in the other branch. The circuit is connected to a 100V, single phase, AC source. Draw the locus of total current and determine
   i. U.P.F current and the corresponding value of R_L
   ii. Minimum current and the corresponding power factor.

   B) For the locus diagram shown in Fig. Q7B, draw the circuit configuration and write all the element values. Also, find the value of variable when the current is maximum.

(10+10)

8. A) Three similar impedances $20\angle -45^o\ \Omega$ are connected in delta across a balanced, 3 phase, 400V AC supply. Determine (i) phase currents (ii) line currents (iii) power factor (iv) power consumed (v) readings of the 2 wattmeters connected to measure the power.

   B) Three equal impedances, each consisting of a resistor in series with an inductor, are connected in star across a 400V, 50Hz, 3 phase, balanced AC supply. The readings of the two wattmeters connected to measure the power read 3KW and 1KW respectively. Determine the value of resistance and inductance in each phase.

(10+10)

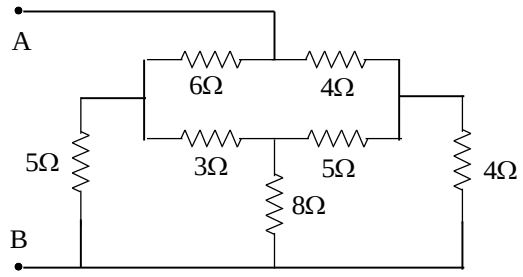

Fig. Q1A

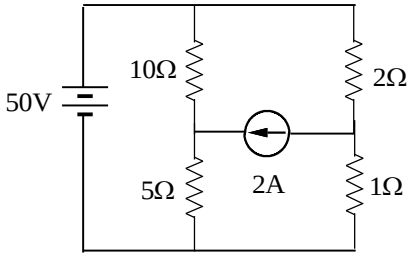

Fig. Q1B

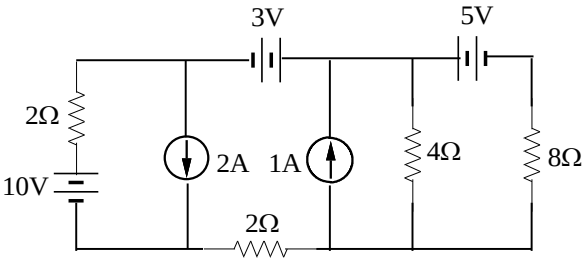

Fig. Q2A

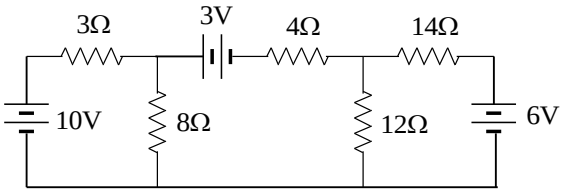

Fig. Q2B

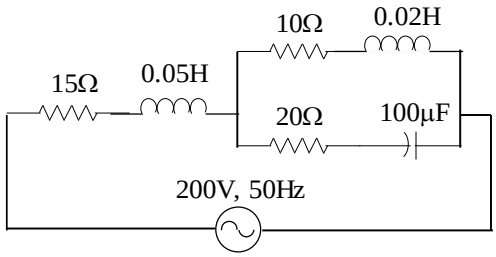

Fig. Q3B

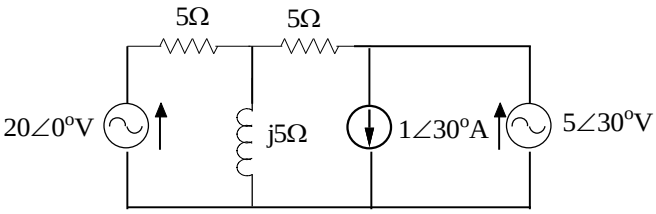

Fig. Q4C

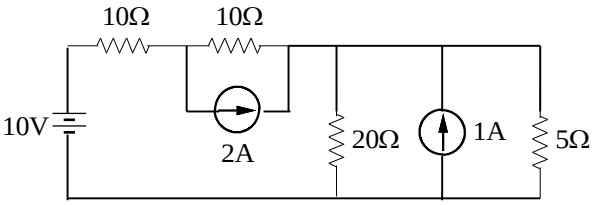

Fig. Q5A

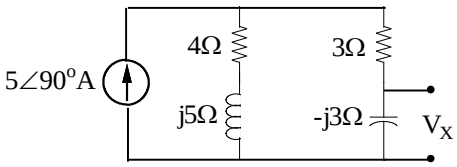

Fig. Q5B

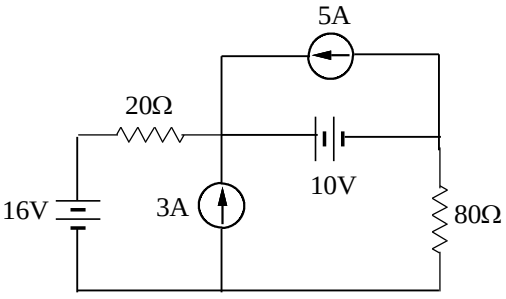

Fig. Q6A

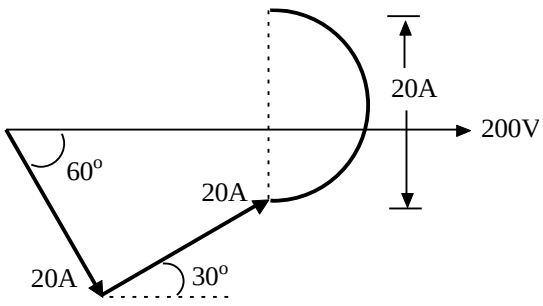

Fig. Q7B