Reg.No.									

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

II SEMESTER B.S. DEGREE EXAMINATION – APRIL/ MAY 2017

SUBJECT: LINEAR NETWORKS IN STEADY STATE ANALYSIS (EE121)

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

Wednesday, 26 April 2017

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

- ✓ **Answer ANY FIVE full Questions.**
- ✓ **Missing data, if any, may be suitably assumed**

1.A) Find the voltage across the 5 ohms resistor in Fig. 1A using source transformation method. (10 Marks)

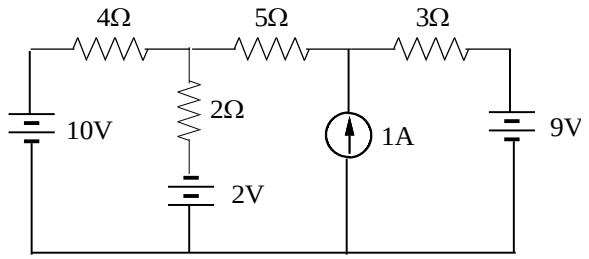

Fig. 1A

1.B) In the network of Fig. 1B, find the power supplied by the source using network reduction technique. (10 Marks)

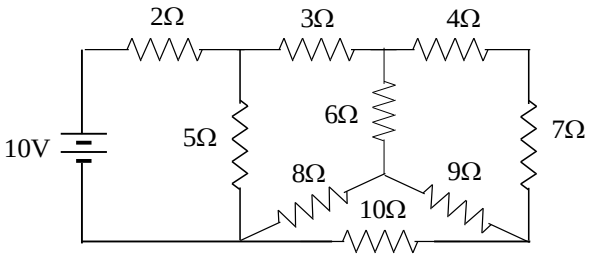

Fig. 1B

2.A) In the network of Fig. 2A, find the current through 3 ohms resistor using mesh current analysis. (10 Marks)

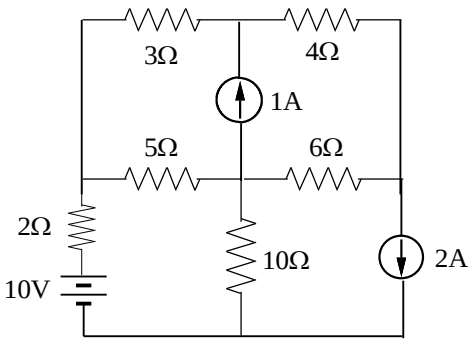

Fig. 2A

2.B) Use node voltage method to find the current through 10 ohms resistor in Fig. 2B. (10 Marks)

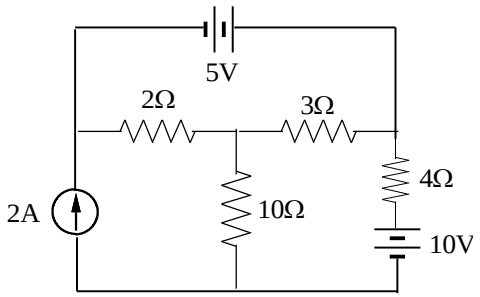

Fig. 2B

3.A) Show that the power consumed by a pure inductor is zero. Draw the waveforms of voltage, current and power. (7 Marks)

3.B) A coil of resistance 50 ohms and inductance 100mH is connected across a 200 V, 50 Hz, single phase AC supply. Determine (i) impedance (ii) current drawn (iii) power factor (iv) power consumed (v) what value of capacitor is to be connected in series to make the overall power factor unity. (7 Marks)

3.C) In the circuit of Fig. 3C, find the equivalent impedance between the terminals A and B. (6 Marks)

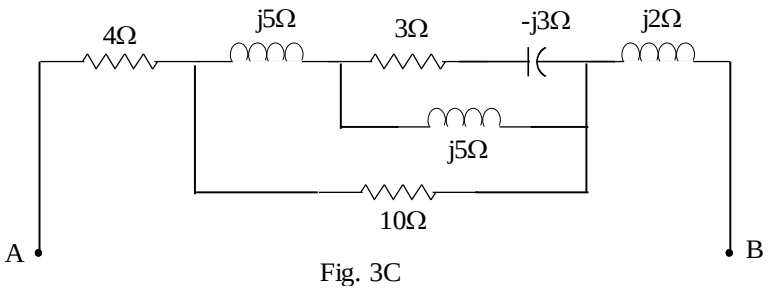

Fig. 3C

4.A) Current through the (4 + j3) ohms impedance in the circuit of Fig. 4A is $2\angle -30^{o}$ A. Find the supply voltage. (10 Marks)

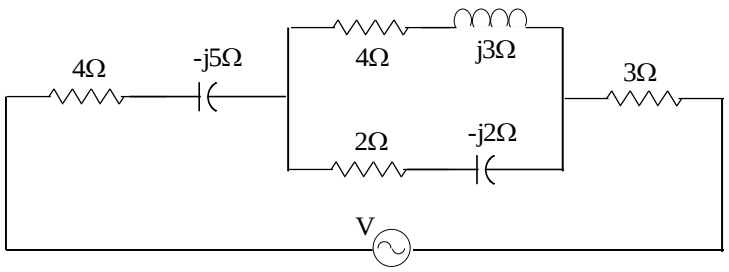

Fig. 4A

4.B) In the network of Fig. 4B, determine the current through (4 + j3) ohms impedance using mesh current analysis. (10 Marks)

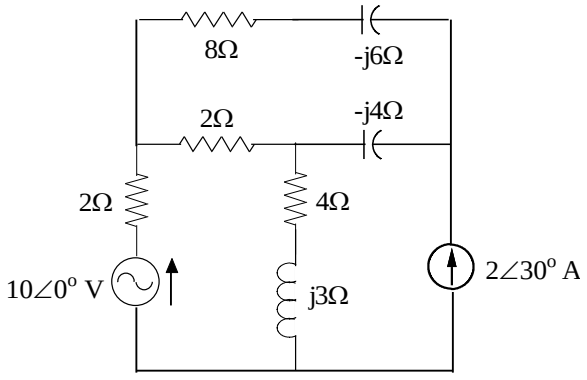

Fig. 4B

5.A) A three branch parallel circuit consisting of Z1 = (8 – j6) ohms, Z2 = (6 + j4) ohms and Z3 = (R + j8) ohms, where R is variable from zero to infinity, is connected across a 200 V, single phase, AC supply. Draw the locus of total current and hence determine the minimum and maximum currents. (10 Marks)

5.B) For the locus diagram shown in Fig. 5B, draw the circuit configuration. Also, determine the currents at unity power factor. (10 Marks)

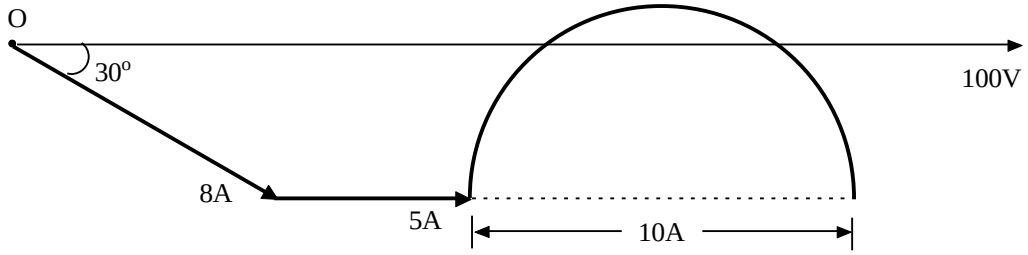

Fig. 5B

6.A) Two wattmeter method is used to measure the total power in a balanced, 3 phase load. With a neat connection diagram, deduce the expression for the wattmeter readings. Hence, show that two wattmeters are sufficient to measure the total power in a 3 phase load. (10 Marks)

6.B) Three similar impedances, each of (20 – j10) ohms, are connected in star across a 400V, 3 phase, RYB supply. Determine (i) line current (ii) power consumed (iii) reactive and apparent powers (iv) readings of the two wattmeters connected to measure the power. (10 Marks)

7.A) Two wattmeter method is used to measure the total power in a 3 phase, balanced, star connected, leading load. The supply voltage is 380 V. Reading of one of the wattmeter is 13684 W and the other wattmeter kicks back. When the potential coil terminals of the second wattmeter is interchanged, it shows 1862 W. Find (i) total power consumed (ii) reactive power (iii) power factor (iv) current in each phase (v) impedance per phase. (10 Marks)

7.B) In the network of Fig. 7B, find the current through 5 ohms resistor using Superposition theorem. (10 Marks)

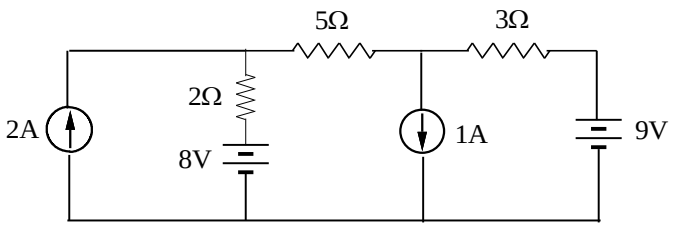

Fig. 7B

8.A) In the network of Fig. 8A, find the value of resistor to be connected across A and B such that maximum power is transferred to the resistor. Also, find the value of the maximum power transferred. (12 Marks)

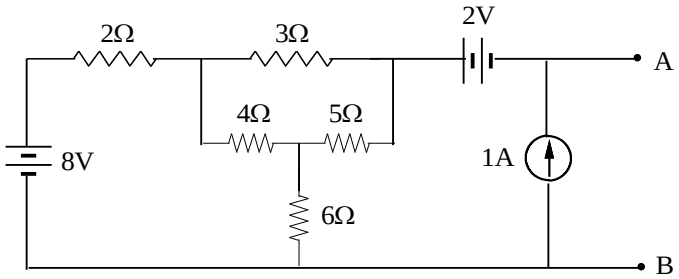

Fig. 8A

8.B) In the network of Fig. 8B, find the current through (4 + j3) ohms impedance using Norton's theorem. (8 Marks)

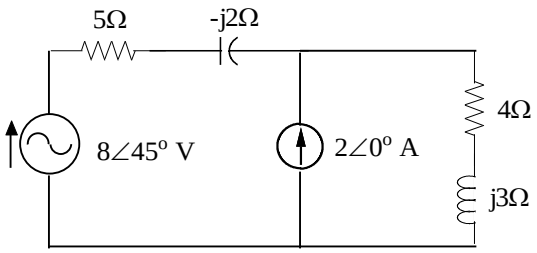

Fig. 8B