**Department of Electrical Engineering, IIT Bombay**

**EE111: Introduction to Electrical Systems**

**Assignment 3**

1. For the circuit shown in Fig. 1 determine the total impedance and the angle between voltage phasor and current phasor. f = 50Hz.
2. A two-element series circuit has the following voltage and current for ω = 2000 rad/sec, V = 150 − 450 and I = 4.746 −116.60. A second voltage source results in an angle of 300between the voltage and current. Determine ω of this second source. What change in frequency would result in a phasor current of 6 Amps? With unlimited variation in frequency, what is the maximum possible phasor current?
3. Two pure circuit elements in a series connection have the following current and applied voltage: v = 150 sin(500t+100) V, i = 13.42 sin(500t−53.40) A. Find the circuital elements.
4. A resistor of R = 5Ω and an unknown capacitor are in series. The voltage across the resistor is v = 25 sin(2000t + 300) V. If the current leads the applied voltage by 60◦, what is the unknown capacitance C?
5. In the parallel circuit of Fig. 2, the voltmeter reads 45 V across the 3Ω resistor. What is the indication on the ammeter? (ac meters read rms value the quantity being measured).
6. In the series-parallel circuit shown in Fig. 3 the effective value of the voltage across the parallel part of the circuit is 50 V. Find the corresponding magnitude of V.
7. For the four-branch parallel circuit of Fig. 4, find the total current and

equivalent impedance.

1. The total current entering the parallel circuit shown in Fig. 5 is given by I = 18645◦. Determine the potential difference between A and B.
2. Replace the active network shown in Fig. 6 with a Thevenin equivalent and a Norton equivalent circuit at the terminals AB.
3. Using Thevenin’s theorem for the network shown in Fig. 7, find V2 such that the current through the (2 + j3) Ω impedance is zero
4. Find the power factor of a station supplying the following loads:

250 KW at unity power factor,

1500 KW at power factor 0.9 lag,

1000 KW at 0.8 lag,

700 KW at 0.9 lead.

If all the loads be carried by the same feeder cable, find what load at unity

factor the cable could carry with the same cable heating.

1. A single-phase load takes a current of 40 A at power factor 0.7 lagging from 440 V, 50 Hz supply. what value must a shunting capacitor is required to improve the power factor to 0.9 lagging, the load remaining the same.
2. A 500 W discharge lamp takes a current of 4 A at unity power factor. Calculate the inductance of a coil required to enable the lamp to work from 250 V, 50 Hz mains. Find also the capacitance of the condenser required to be connected across the mains to bring the resultant power factor to unity.



