1. Explain the following terms: (5% each)
(a) form factor (b) proper tree (c) susceptance (d) zero-state response

2. Synthesize the impedance of the one-port network as following: (20%)

$$Z(s) = \frac{6 s^2 + 19 s + 18}{s^2 + s + 10}$$

3. The input voltage to a simple low-pass RC (R=10-kΩ, C=10 μF) filter circuit is:

$$Vi(t) = 15 \exp(-5t)\, u(t) \text{ volts.}$$

where u(t) is a unit step function.
(a) What percentage of the 1-Ω energy available in the input signal is available in the output signal ? (10%)
(b) What percentage of the output energy is associated with the frequency range $0 \leqq \omega \leqq 10$ rad/s ? (10%)

4. Use graph theory to solve the network shown in Fig. P4. Compute:
(a) the value and the direction of the current in the 3-Ω resistor. (10%)
(b) the power delivered by the 10-V voltage source. (10%)

5. A 220-V three-phase three-wire ACB system feeds a three-phase load. Two wattmeters are properly connected to lines A and C. Take the voltage of line A to neutral as the reference phasor.
(a) If the load is an unbalanced Y-connected load with ZA = 10+j17.32Ω, ZB = 10Ω and ZC = -j10Ω. Calculate the line currents, the total system power, and the readings of the two wattmeter. (10%)
(b) If the readings of the two wattmeters are: WA=920-W and WC=460-W, and the load is a balanced Δ-connected load, find the phase impedance of the load. (10%)

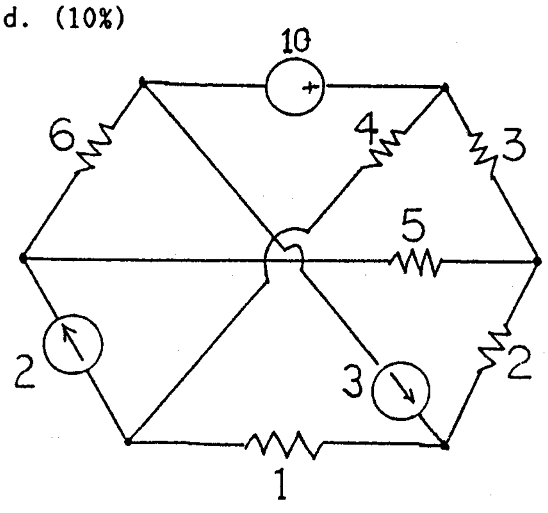

Fig. P4 (V, A, Ω)