B.Sc. Engg. (CSE)/ HD CSE, 2nd Sem. Date: October 26, 2017 (Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Semester Final Examination — Summer Semester, A. Y. 2016-2017
Course No.: Phy 4241 — Time: 3 Hours
Course Title: Physics II — Full Marks: 150

There are **8 (eight)** questions. Answer **any 6 (six)** questions. All questions carry equal marks. Marks in the margin indicate full marks. Programmable calculators are not allowed. Do not write on this question paper. Assume suitable value for any missing data.

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1. a) For the network in Fig. 1(a), determine the sinusoidal expression for the voltage 'v'. 13

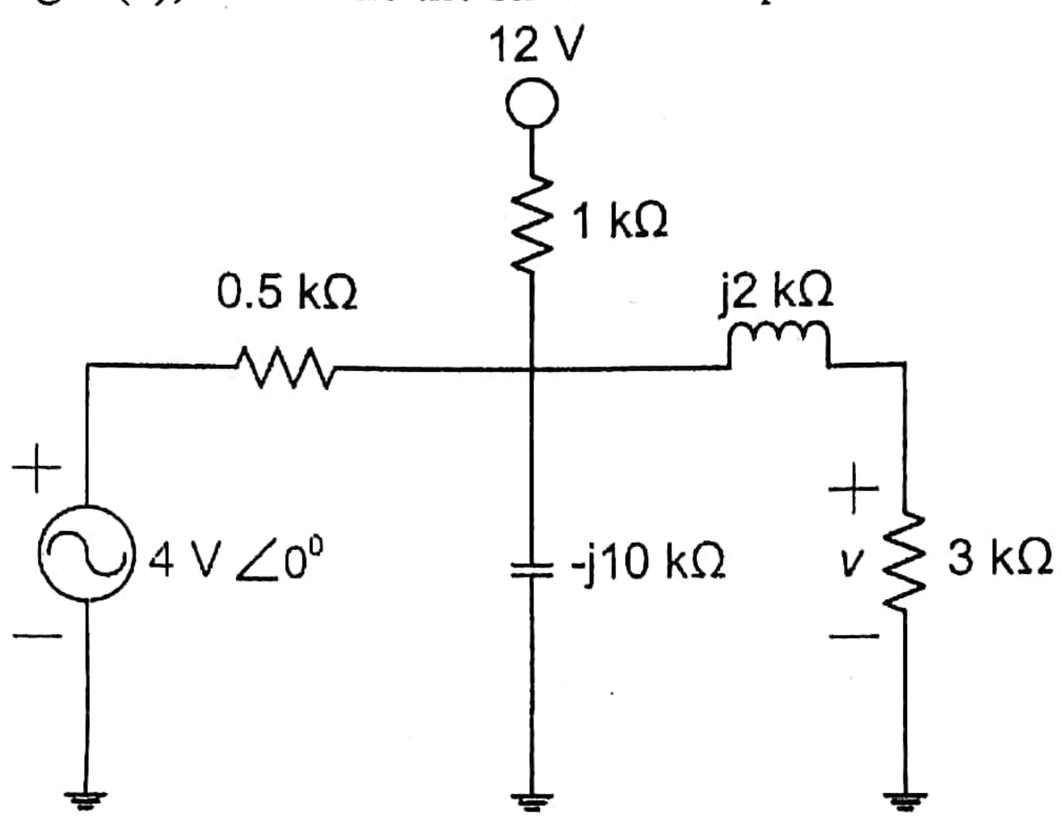

Fig. 1(a)

b) What is power factor correction? How and why is it done? Explain with proper circuits and phasor diagram. 5

c) Prove that in case of AC circuits for maximum average power transfer, the load impedance must be equal to the complex conjugate of the Thevenin impedance and find the expression for maximum average power. 7

2. a) Find 'I' for the circuit in Fig. 2(a) 12

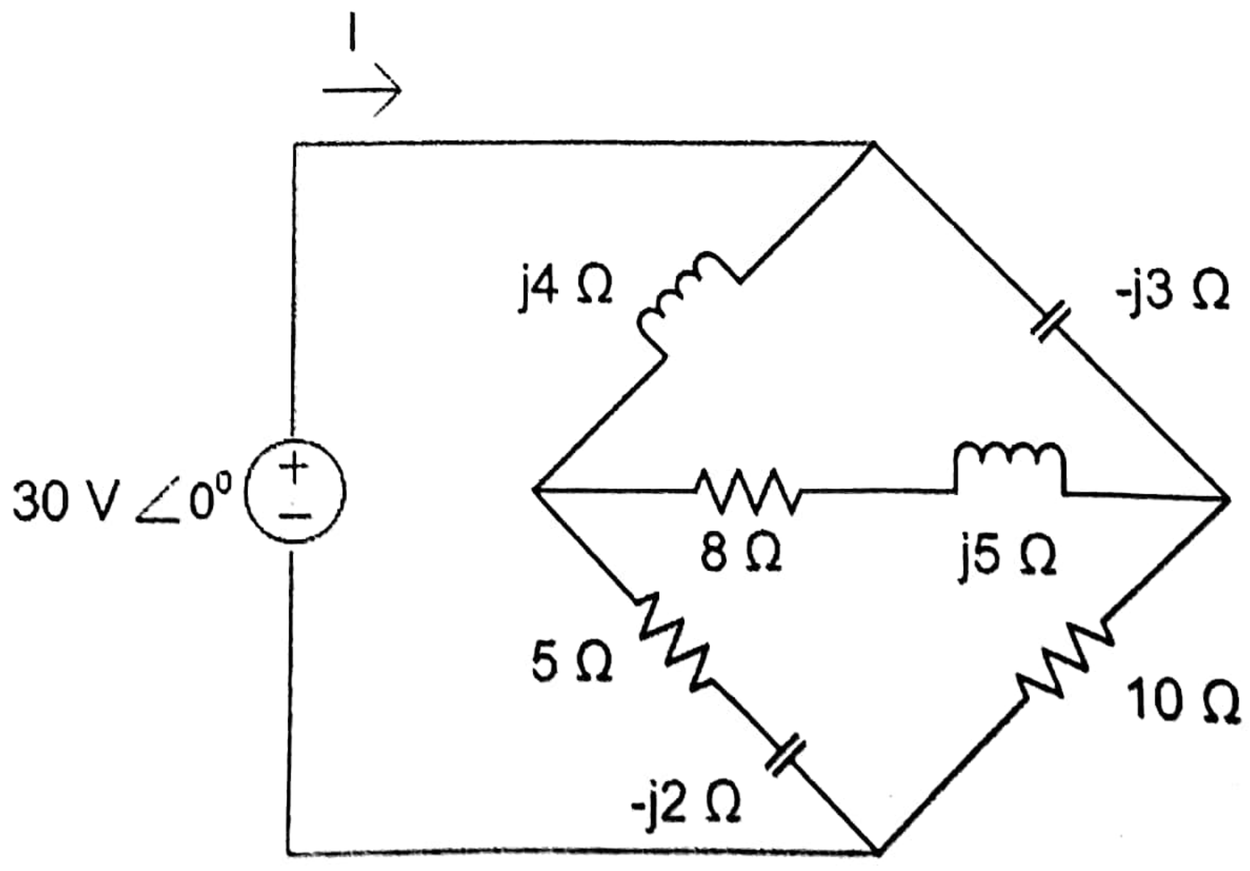

Fig. 2(a)

b) In the circuit of Fig. 2(b), find:
   a) $v(0^+)$ and $i(0^+)$,
   b) $dv(0^+)/dt$ and $di(0^+)/dt$,
   c) $v(\infty)$ and $i(\infty)$.

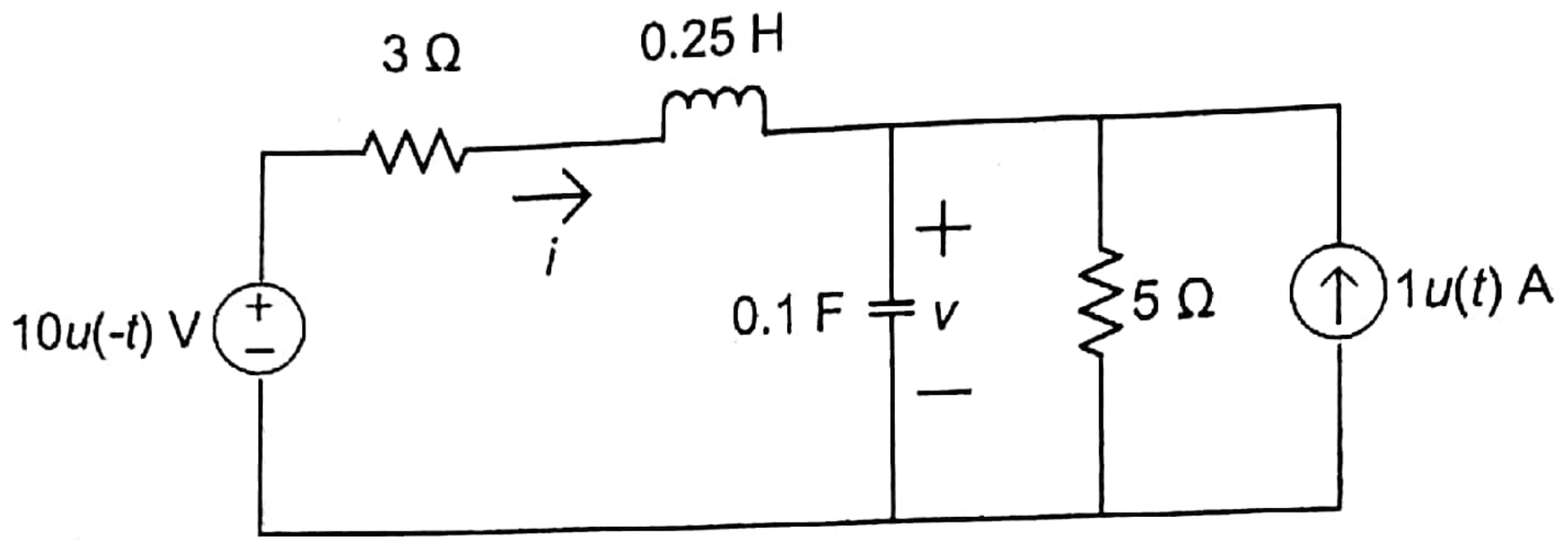

Fig. 2(b)

3. a) Find the effective value of f(t) defined in Fig. 3(a). 10

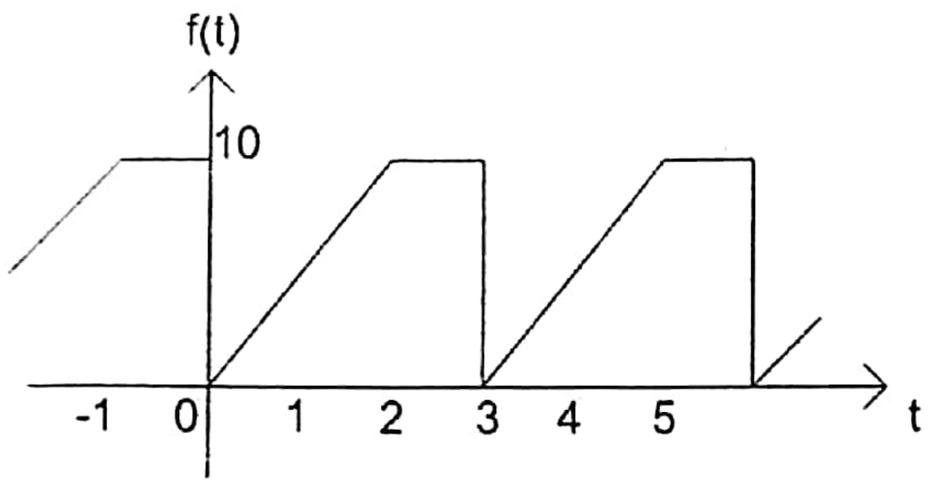

Fig. 3(a)

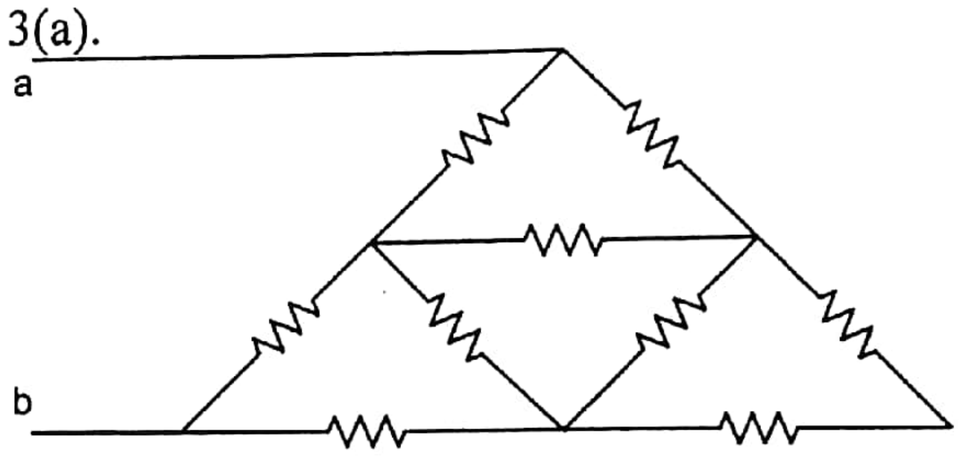

Fig. 3(b)

b) Obtain the equivalent resistance, R_{ab} in the circuit of Fig. 3(b) where all resistors have a value of 30 Ω. 10

c) Which method is preferred between nodal and mesh analysis? Why? 5

4. a) For the series magnetic circuit in Fig. 4(a) find the value if 'I' required to develop a magnetic flux of $\Phi = 4\times10^{-4}$ Wb. Given the μ_r for the material under these circumstances is 935.83. [$\mu_0 = 4\pi\times10^{-7}$] 10

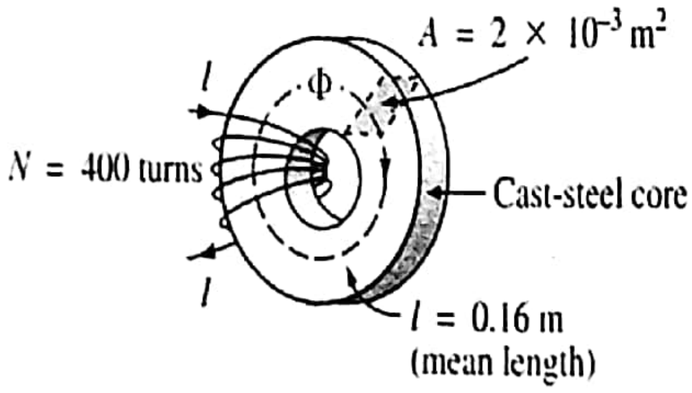

Fig. 4(a)

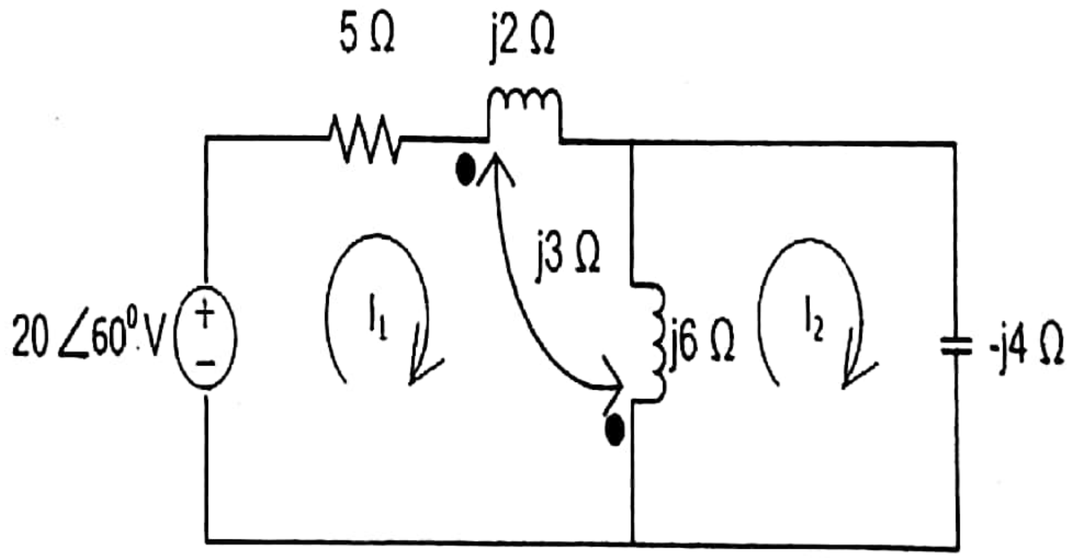

Fig. 4(b)

b) Determine the phasor currents 'I_1' and 'I_2' in the circuit of Fig. 4(b). 15

5. a) For the circuit in Fig. 5(a), find all the currents using mesh analysis. 10

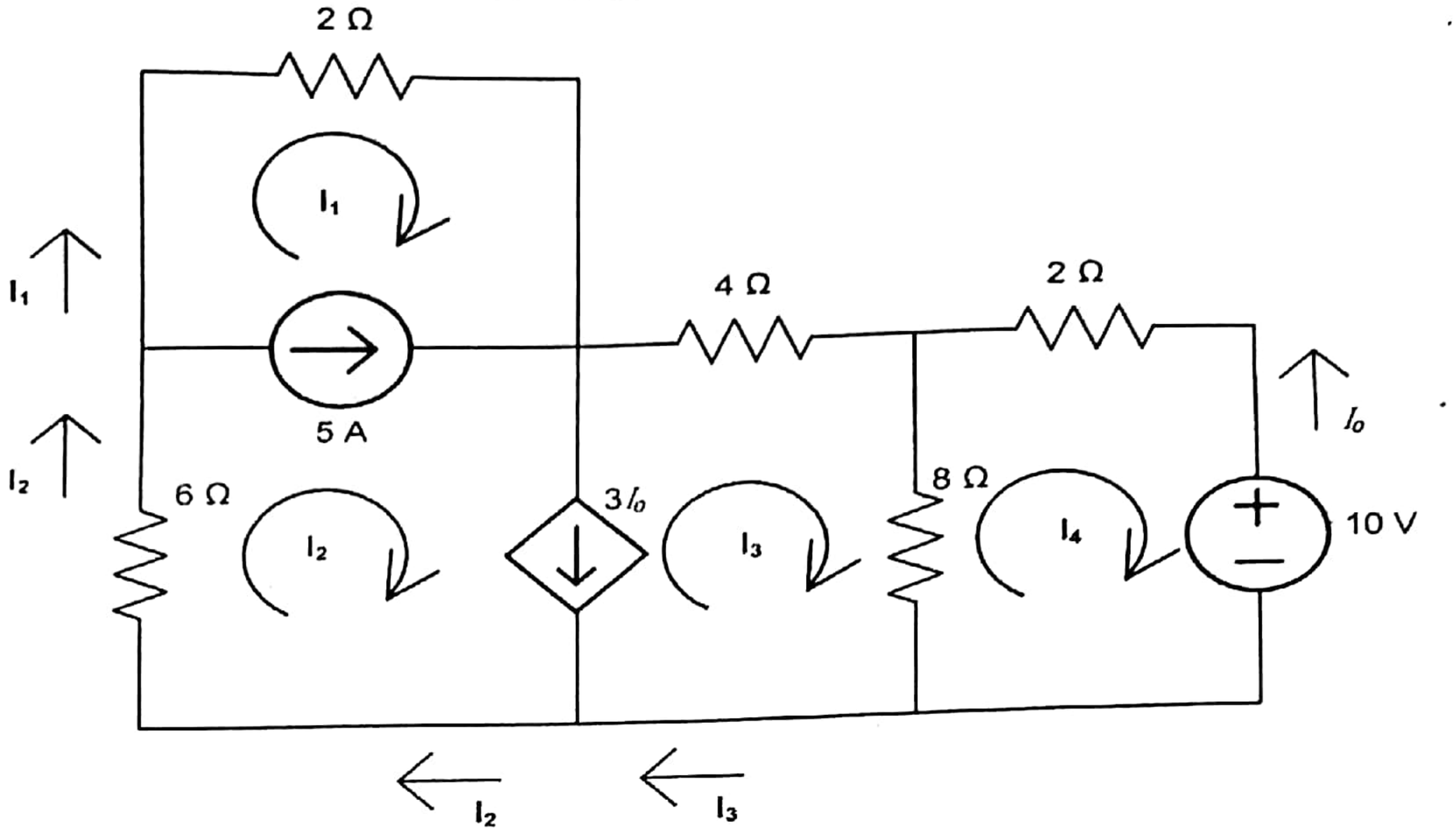

Fig. 5(a)

b) Find current 'I' in the circuit shown in Fig. 5(b). Show all the voltages, current 'I' and Z_{eq} in phasor diagram. 10

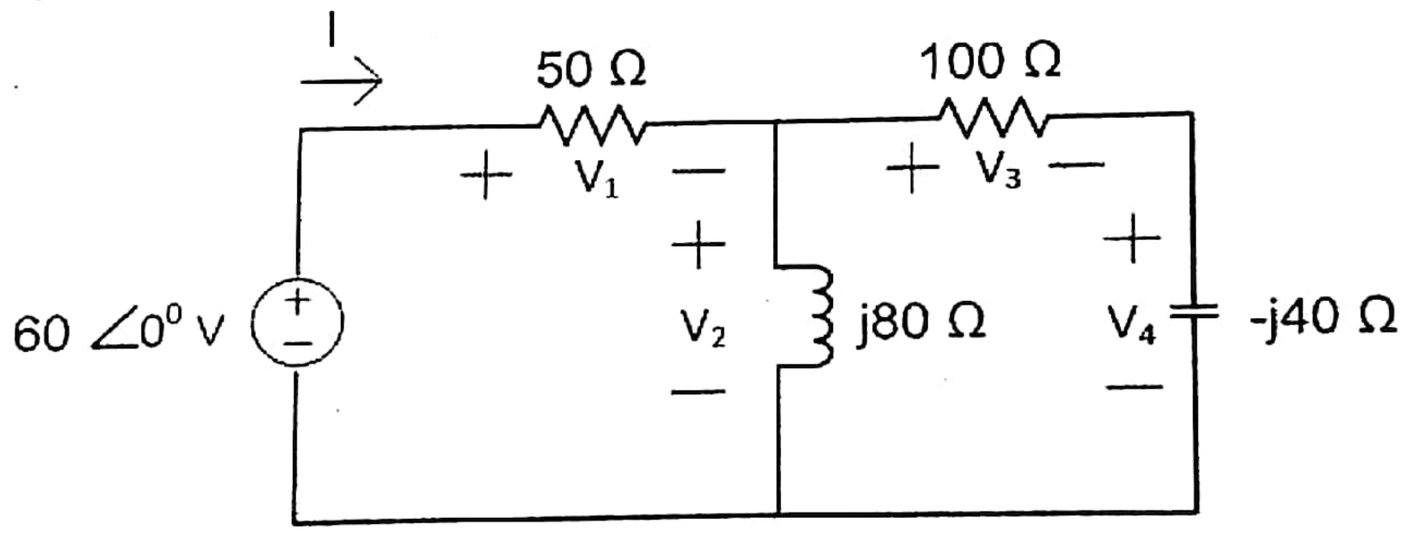

Fig. 5(b)

c) What do you mean by 'power triangle'? Draw the power triangle for both leading and lagging power factor with proper axes. 5

6. a) Determine the voltage across the inductor for the network in Fig. 6(a). 13

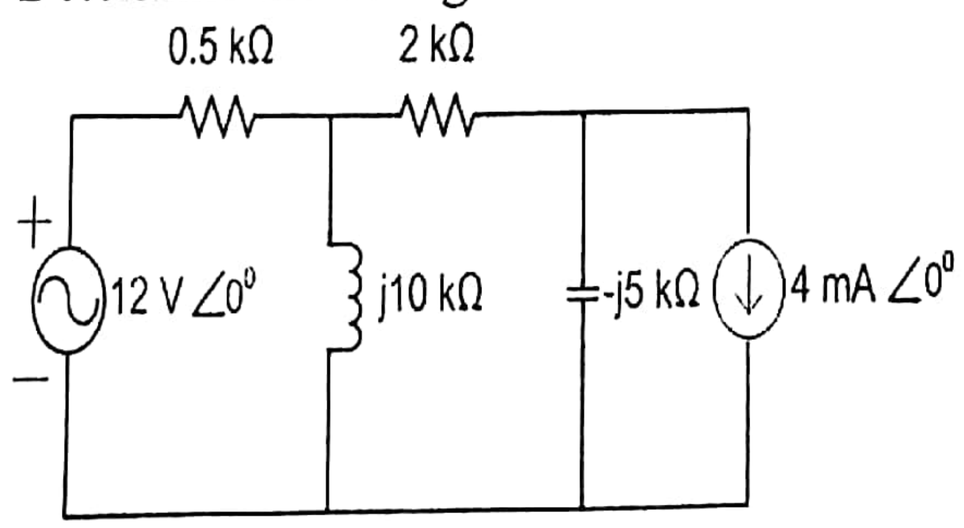

Fig. 6(a)

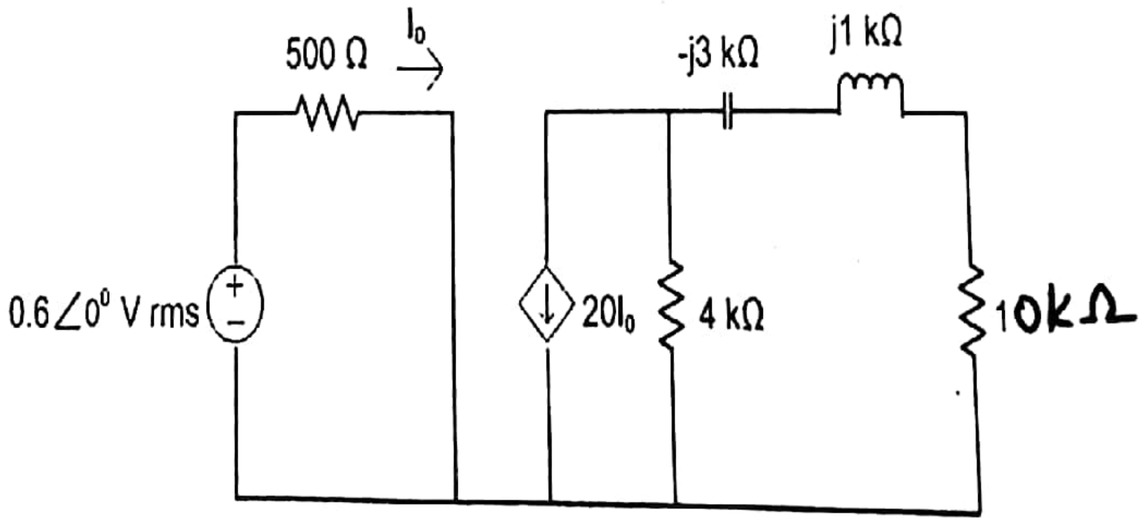

Fig. 6(b)

b) Obtain the complex power delivered to the 10 kΩ resistor in Fig. 6(b). 12

7. a) For source free series RLC circuit find the expression of i(t) for
   a) Overdamped case,
   b) Critical damped case,
   c) Underdamped case.
   Mention the conditions for each of the cases. 13

   b) Find v(t) for t>0 in the circuit shown in Fig. 7(b).

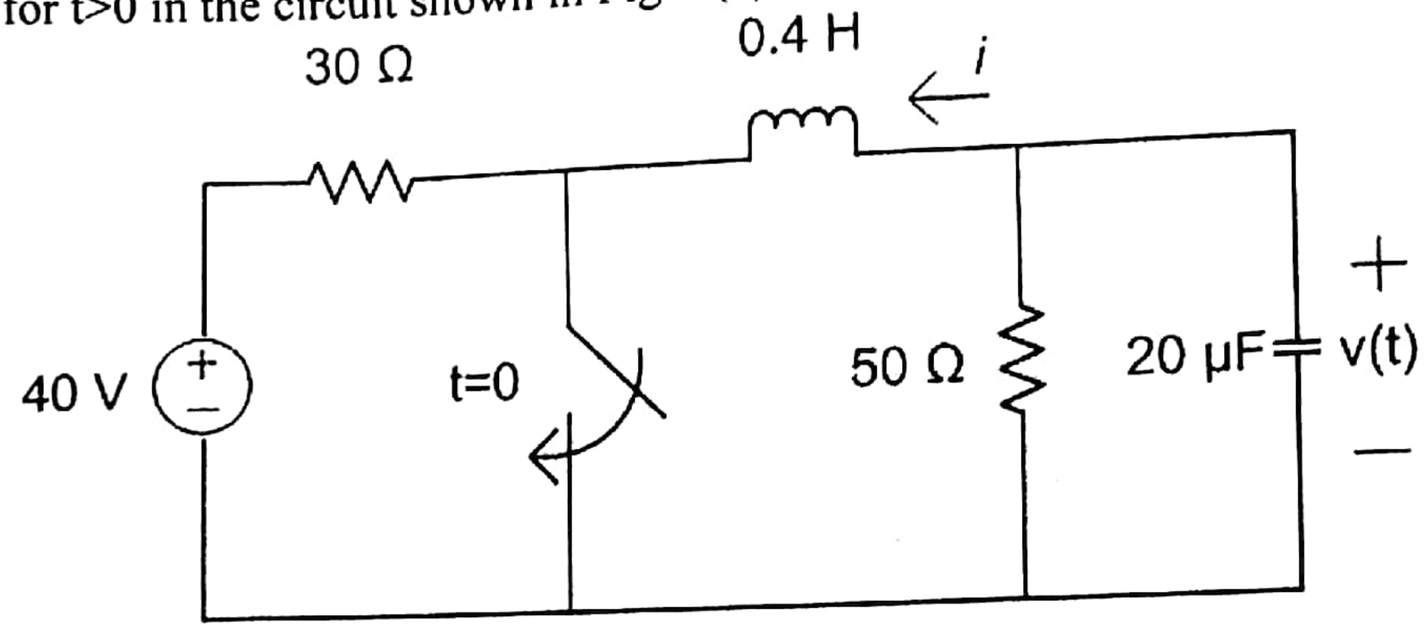

Fig. 7(b)

8. a) Given the circuit in Fig. 8(a), obtain the Norton equivalent as viewed from the terminals 15
   a) a-b,
   b) c-d.

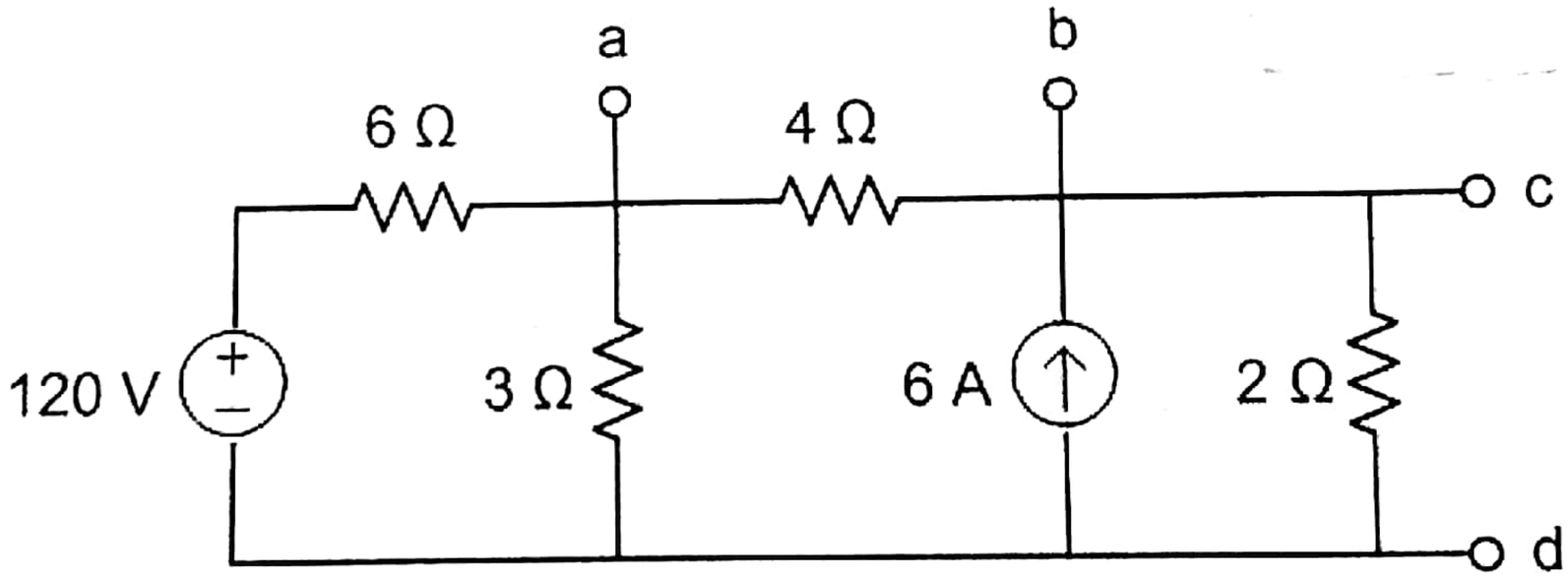

Fig. 8(a)

   b) Calculate the current gain i_0/i_s in the circuit of Fig. 8(b) 10

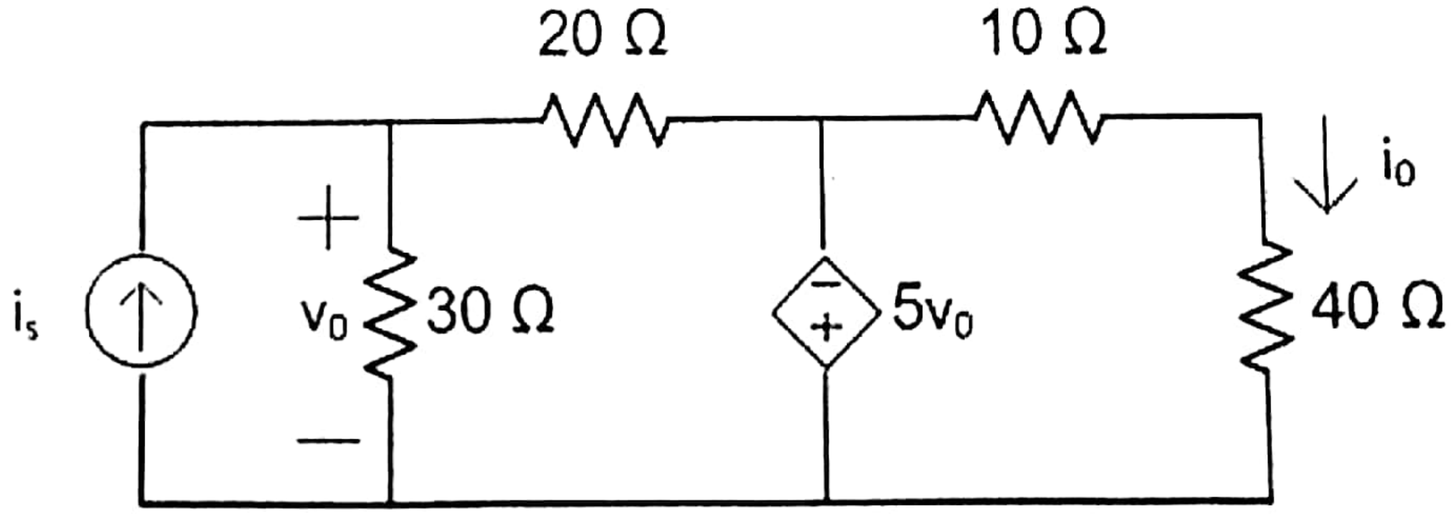

Fig. 8(b)