B.Sc. Engg. (CSE), 2nd Sem.

Date: October 30, 2018

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Semester Final Examination
Course No.: Phy 4241
Course Title: Physics II

Summer Semester, A. Y. 2017-2018
Time: 3 Hours
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.

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1. a) The circuit of Fig. 1(a) contains five identical capacitors. Find the value of C. 09

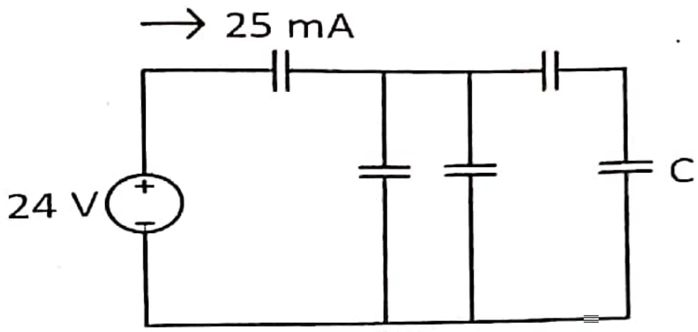

Fig. 1(a)

b) Determine L_{eq} of the inductive network of Fig. 1(b) at the terminals a-b. 13

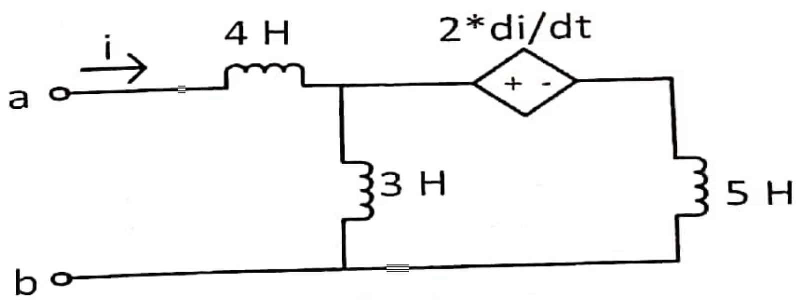

Fig. 1(b)

c) The current through a 12 mH inductor is 4 sin (100t) A. Find the voltage across the inductor for $0 < t < \frac{\pi}{200}$ s and the energy stored at $t = \frac{\pi}{200}$ s. 03

2. a) Calculate the mesh currents, I_1 and I_2 in the circuit of Fig. 2(a) 10

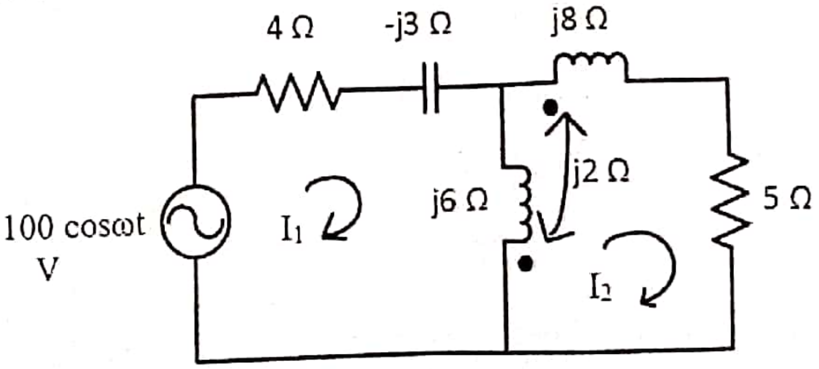

Fig. 2(a)

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b) For the network in Fig. 2(b), find Z_{ab} and I_0.

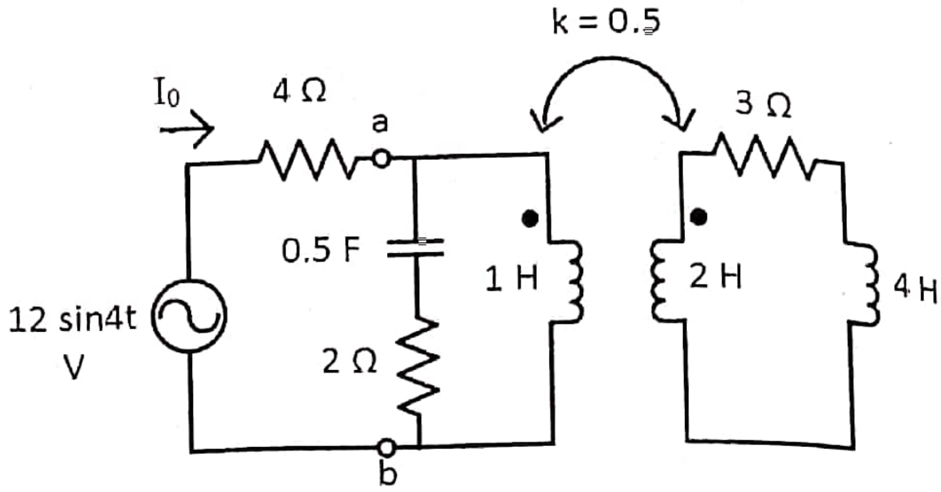

Fig. 2(b)

3. a) Find the current, I in the circuit of Fig. 3(a).

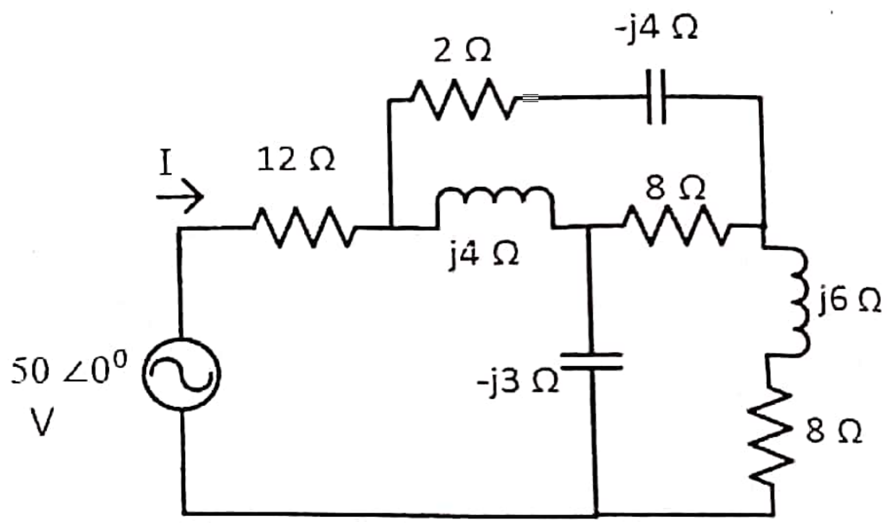

Fig. 3(a)

b) In the circuit of Fig. 3(b), find V_s if $I = 2\angle 0^0$ A.

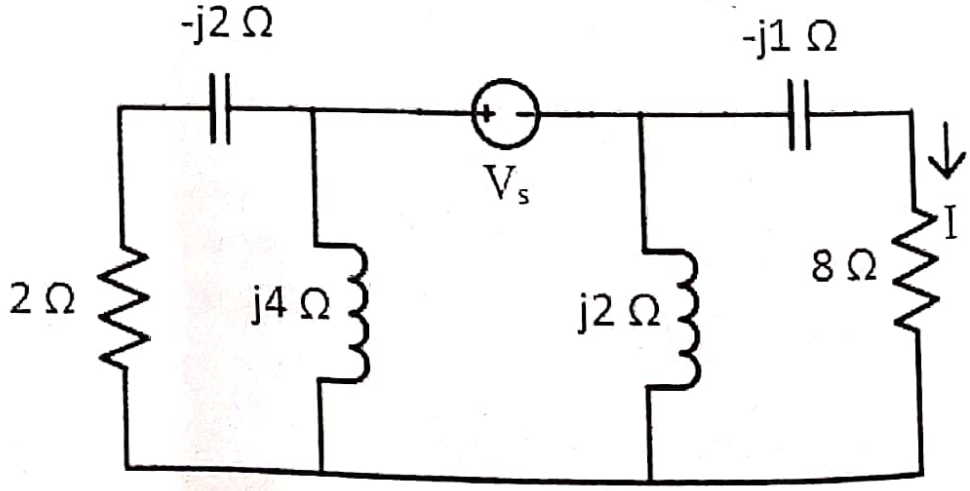

Fig. 3(b)

4. a) In solving for currents using mesh analysis, the following equations are obtained. Draw the circuit and find the currents. 12

$$15\,i_1 - 10\,i_2 = -10$$
$$10\,i_1 - 22\,i_2 + 10\,i_3 = 0$$
$$10\,i_2 - 15\,i_3 = 12$$

b) Find the current, i in the 10 kΩ resistor in the circuit shown in Fig. 4(b) by making a succession of appropriate source transformations. 13

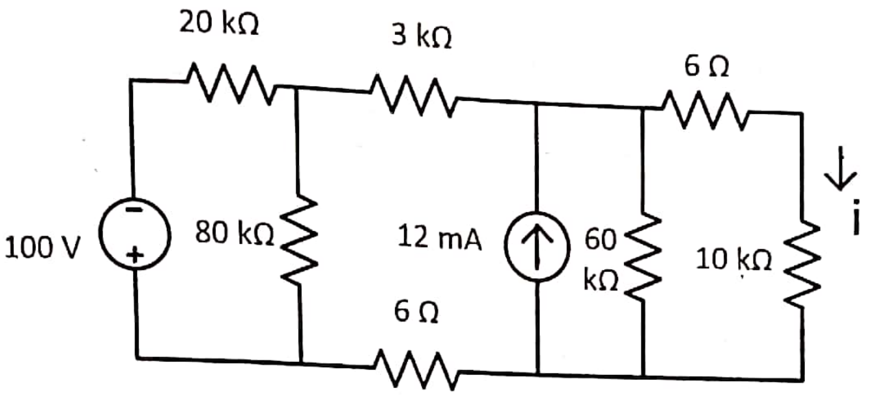

Fig. 4(b)

5. a) Find the average power absorbed by the 8 Ω resistor in the circuit shown in Fig. 5(a). 18

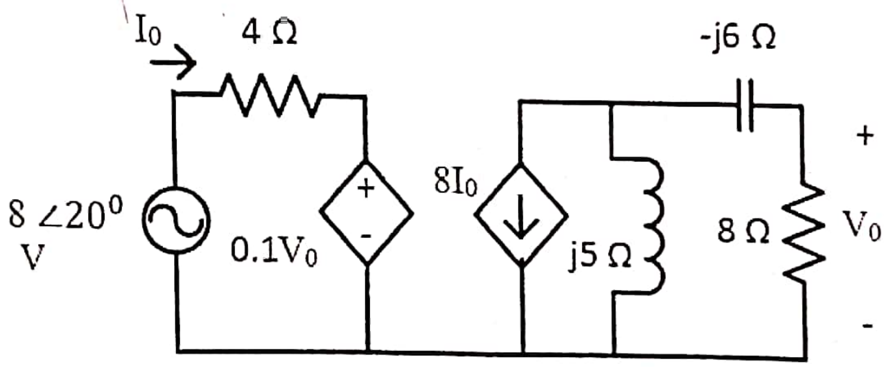

Fig. 5(a)

b) Determine the Thevenin equivalent of the circuit in fig. 5(b) as seen from the terminals a-b. 07

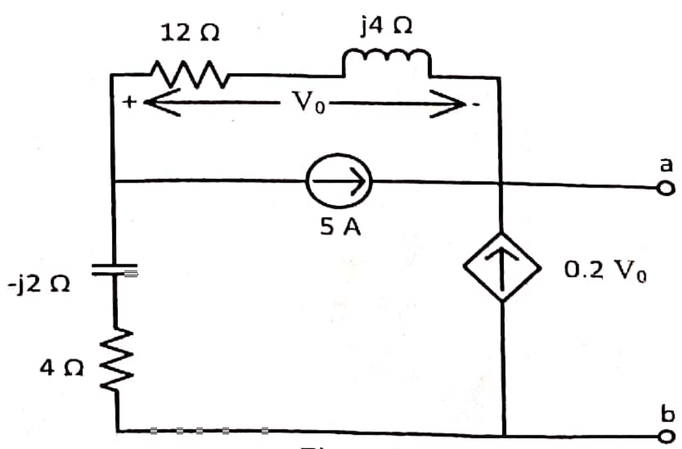

Fig. 5(b)

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6\. a) Obtain the inductor current, $i(t)$ for both $t < 0$ and $t > 0$ in the circuit of Fig. 6(a).

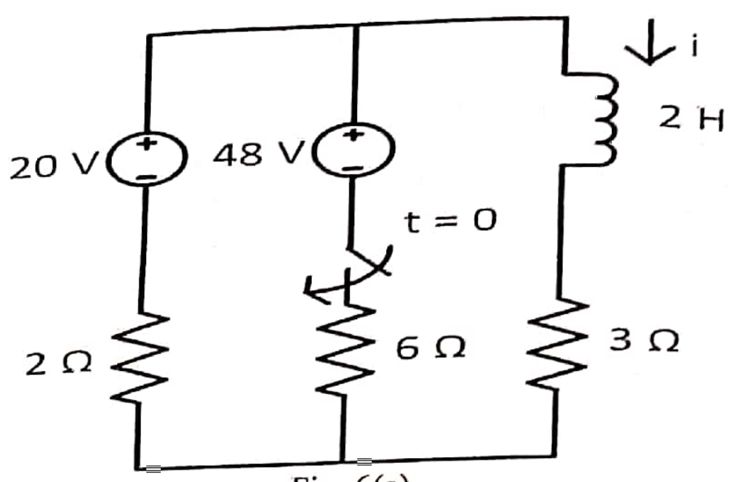

Fig. 6(a)

b) Find the current, $i(t)$ for both $t < 0$ and $t > 0$ in the circuit shown in Fig. 6(b).

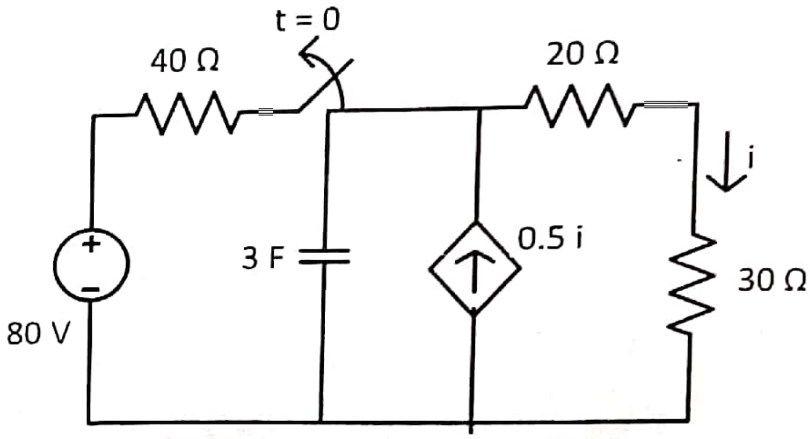

Fig. 6(b)

7\. a) Compute the value of R that results in maximum power transfer to the 10 Ω resistor shown in Fig. 7(a). Find the maximum power.

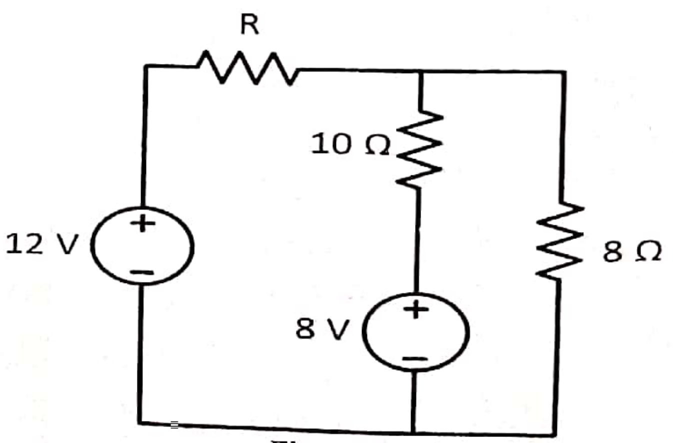

Fig. 7(a)

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b) Obtain the Norton equivalent of the circuit shown in Fig. 7(b) to the left of terminals x-y. Use the result to find the current, *i*. 15

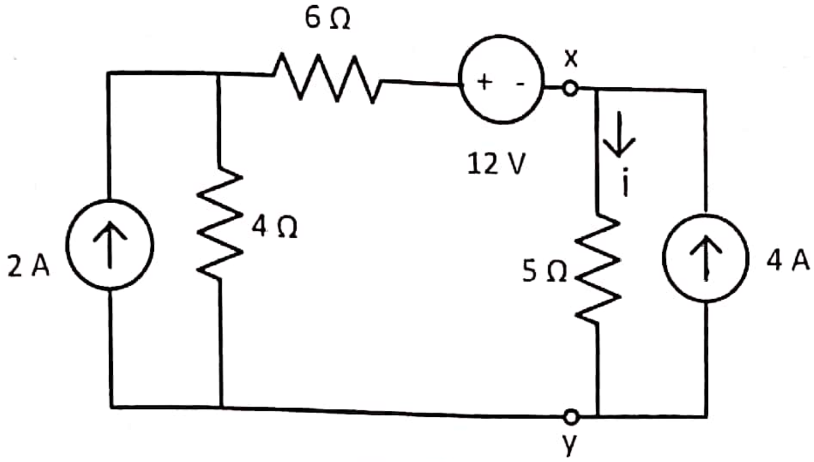

Fig. 7(b)

8. a) Select values for R_1 and R_2 in the circuit of Fig. 8(a) so that $V_R(0^+) = 10$ V and $V_R(1\text{ ms}) = 5$V. 12

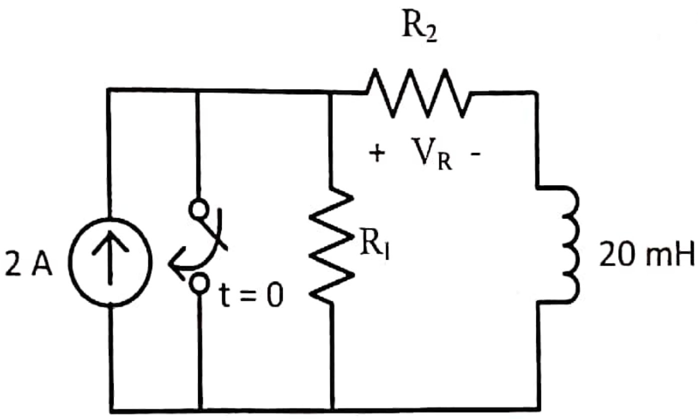

Fig. 8(a)

b) For the circuit shown in Fig. 8(b), Find equivalent resistance by looking into terminals a-b. For finding equivalent resistance, connect a 1 A current source across terminals a-b. (No other method will be acceptable). 13

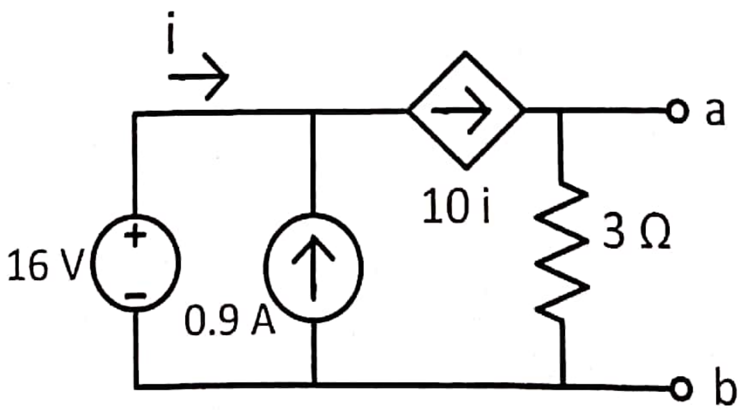

Fig. 8(b)

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(CSE) HD CSE, 2nd Sem.

Date: October 26, 2017 (Morning)

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DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

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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

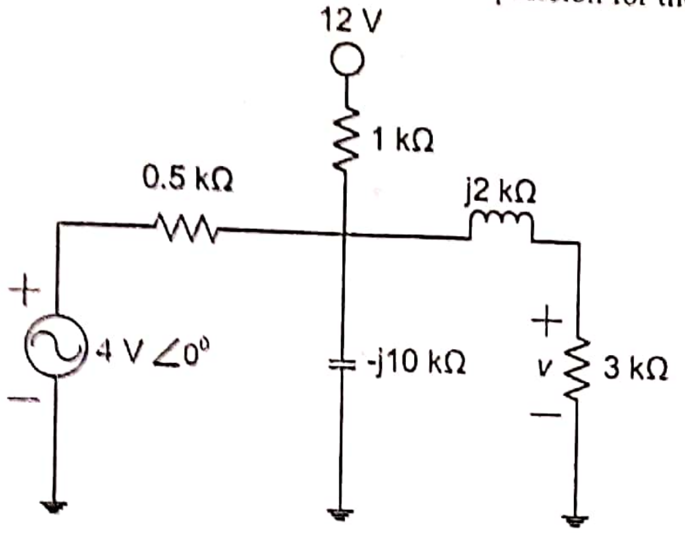

Fig. 1(a)

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

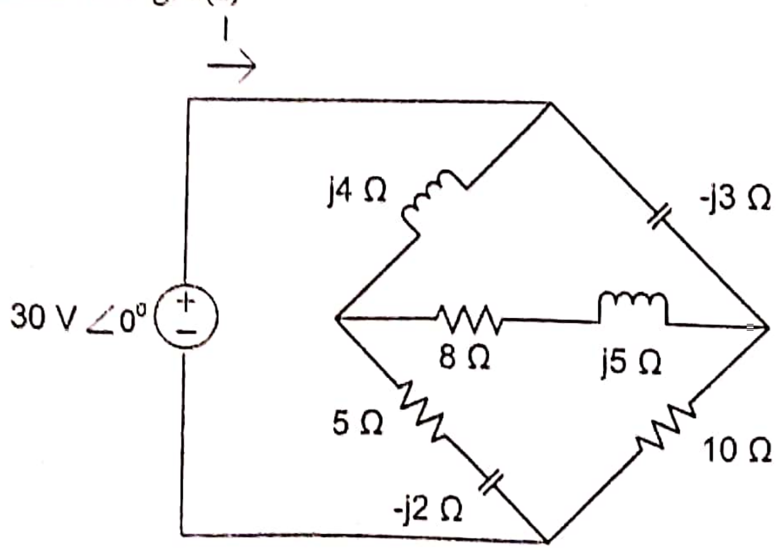

Fig. 2(a)

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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 $i(\infty)$.

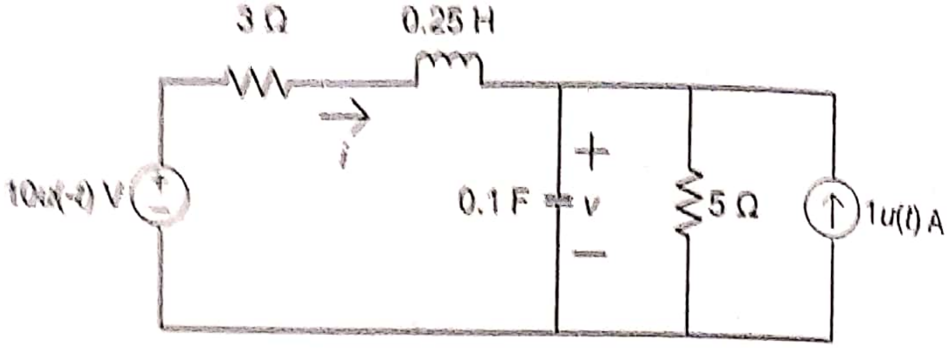
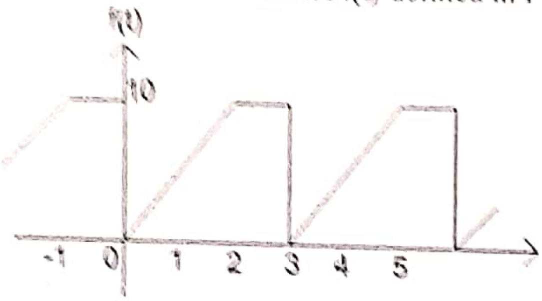


Fig. 2(b)

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



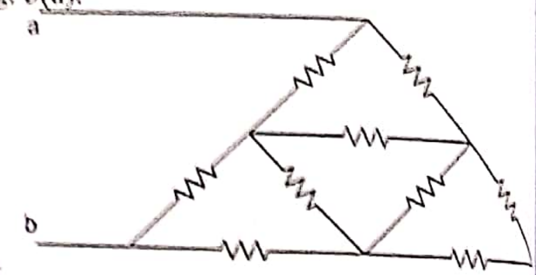


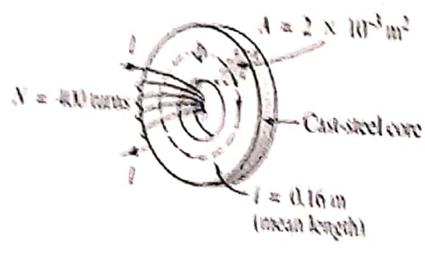
Fig. 3(a)

Fig. 3(b)

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

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

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. [$\mu_0 = 4\pi\times10^{-7}$]



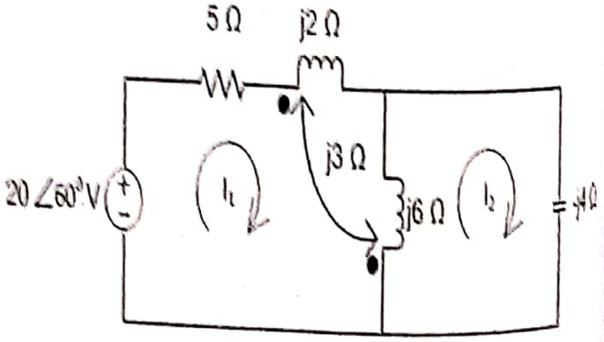


Fig. 4(a)

Fig. 4(b)

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

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

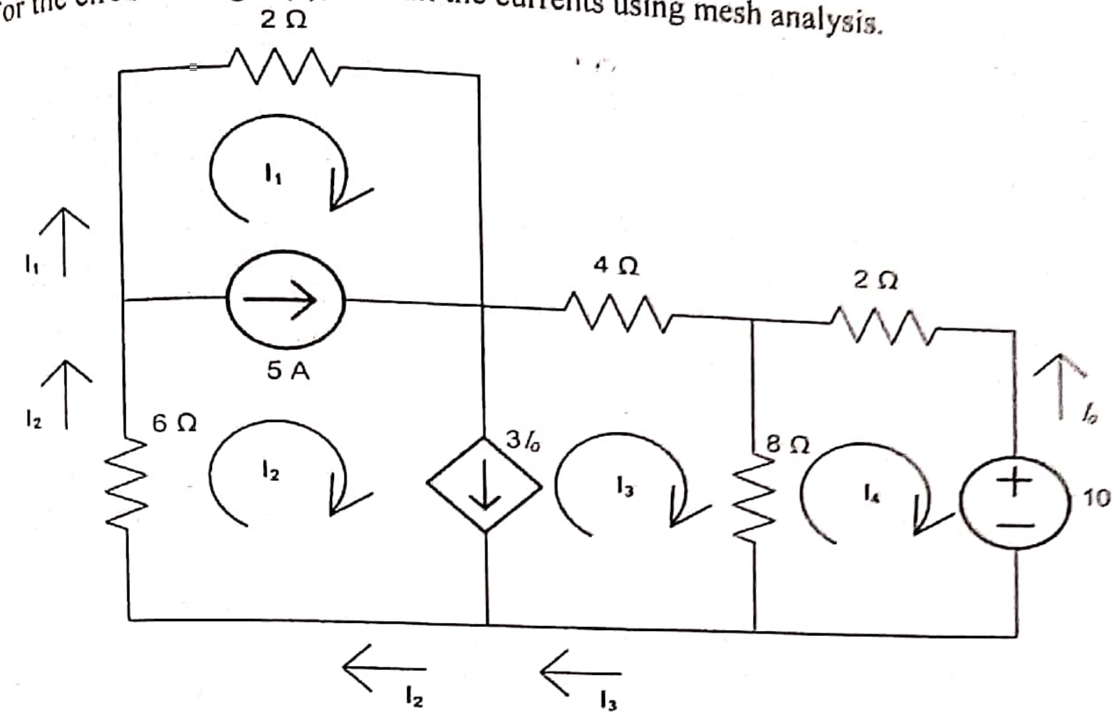


Fig. 5(a)

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

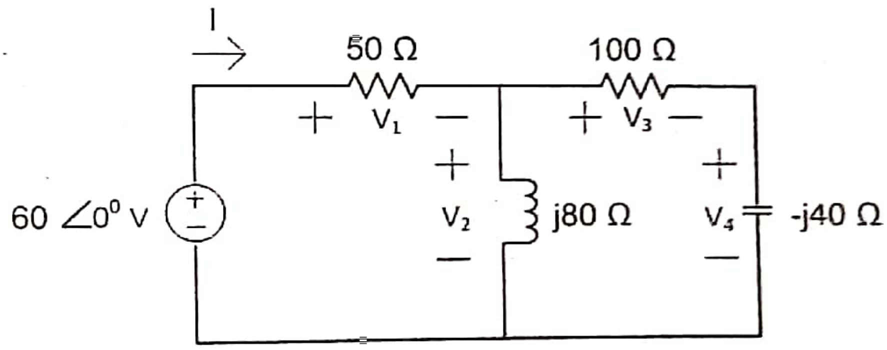


Fig. 5(b)

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

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

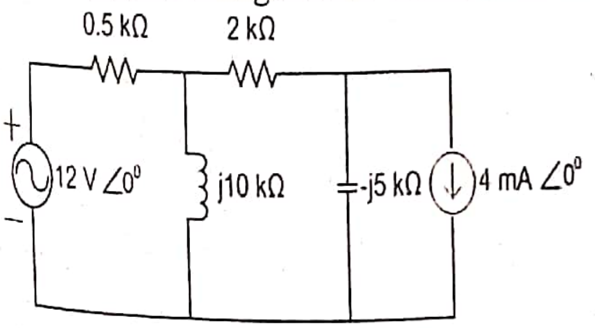


Fig. 6(a)

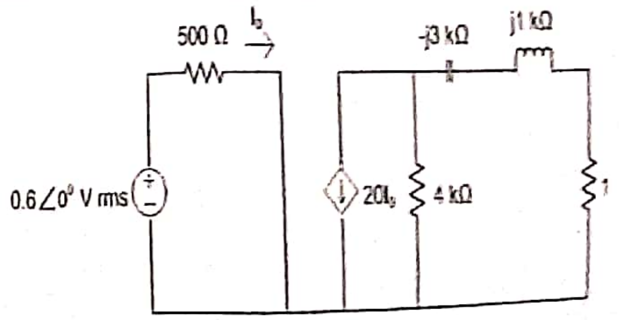


Fig. 6(b)

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

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7. a) For source free series RLC circuit find the expression of i(t) for
   a) Overdamped case,
   b) Critically damped case,
   c) Underdamped case.

   Mention the conditions for each of the cases.

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

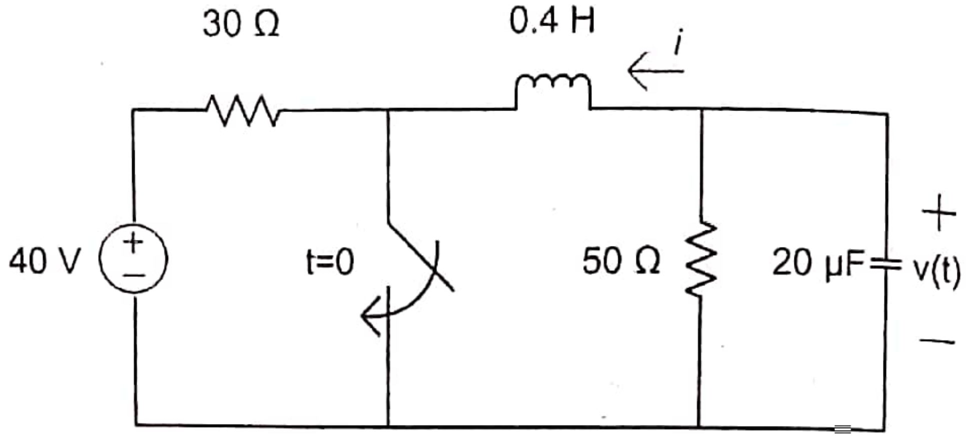

Fig. 7(b)

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

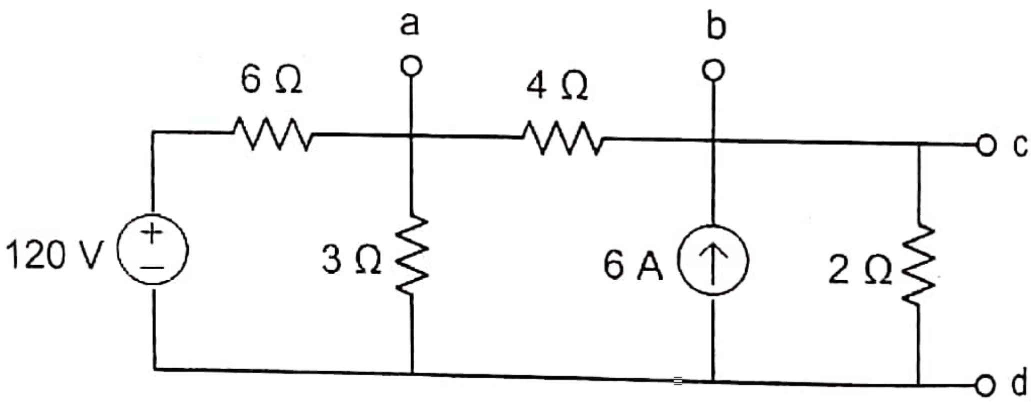

Fig. 8(a)

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

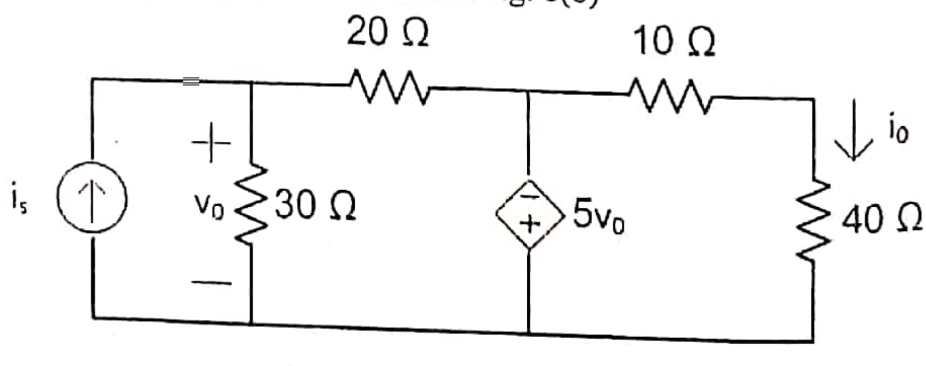

Fig. 8(b)

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B.Sc. Engg. (CSE)/ HDCSE, 2nd Sem. Date: October 31, 2016 (Morning)

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DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Semester Final Examination | Summer Semester, A.Y. 2015-2016
Course No.: Phy 4241 | Time: 3 Hours
Course Title: Electrical Engineering Fundamentals | 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 values for any missing data.

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1. a) The voltage across a 2 F capacitor is shown in Fig. 1(a). Find and draw the current wave shape through the capacitor. 10

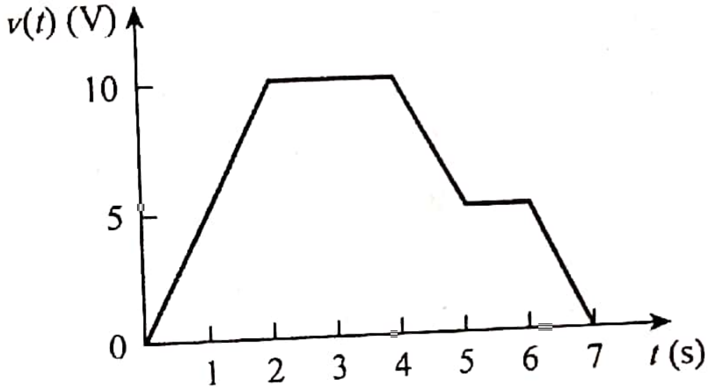

Fig. 1(a)

b) Draw the complete phasor diagram for the circuit in Fig. 1(b). 15

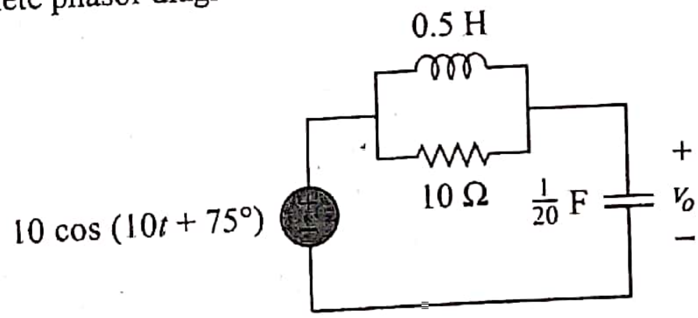

Fig. 1(b)

2. a) For the circuit in Fig. 2(a), find out i, i_L, v_C, energy stored in the capacitor and inductor under dc conditions. 10

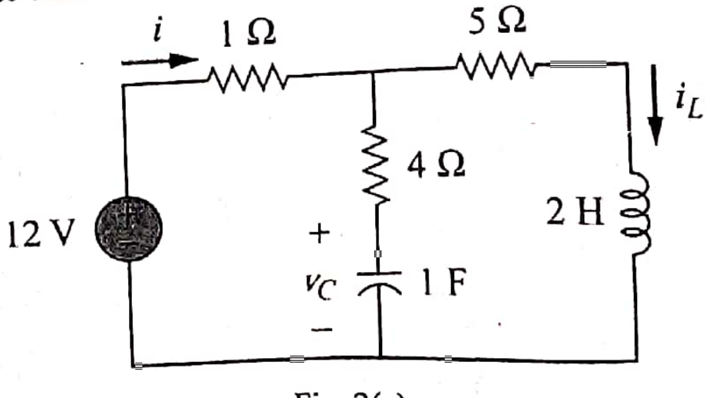

Fig. 2(a)

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b) The voltage across a load is $v(t) = 60\cos(\omega t - 30^0)$ V and current through the element in the direction of the voltage drop is $i(t) = 1.5\cos(\omega t + 50^0)$ mA. Find: (i) the complex power and apparent power (ii) the real power and reactive power (iii) the power factor and load admittance. 15

3. a) Use nodal analysis to obtain all the node voltages in the circuit of Fig. 3(a). 15

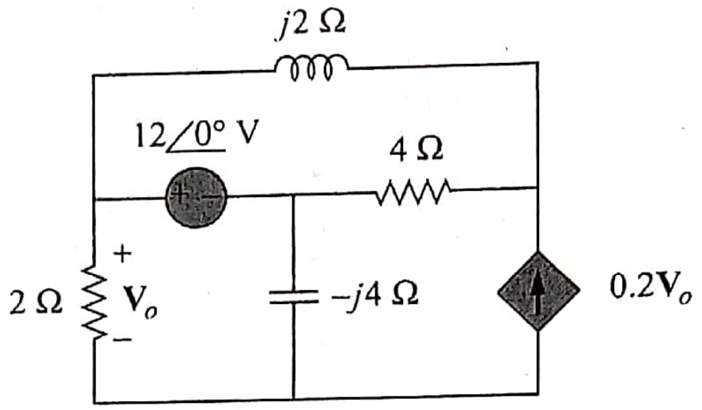

Fig. 3(a)

b) Given $i(t) = 3\cos(\omega t + 30^0)$ and $v(t) = -5\sin(\omega t - 20^0)$, find (i) $i(t) + v(t)$ in phasor form (ii) phase difference between $i(t)$ and $v(t)$. 10

4. a) Find out the phasor currents I_1 and I_2 in the circuit of Fig. 4(a). 15

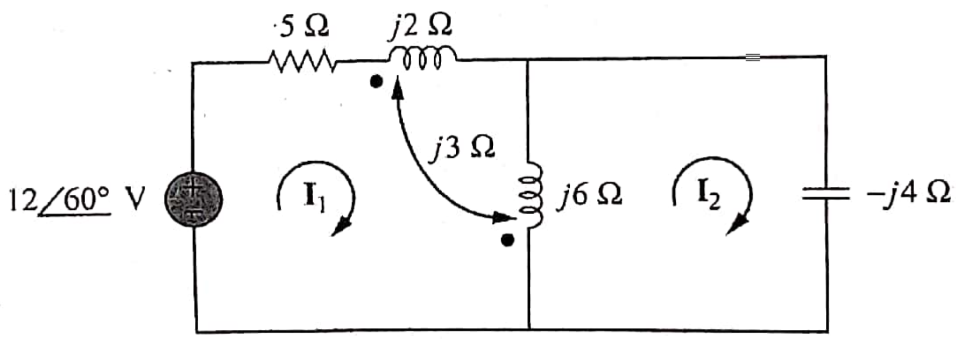

Fig. 4(a)

b) How can you improve the power factor of a capacitive load? Derive the equation to find out the value of the capacitor or inductor needed in this process with proper circuit diagrams. 10

5. a) Use superposition to find out I_x in the circuit of Fig. 5(a). 10

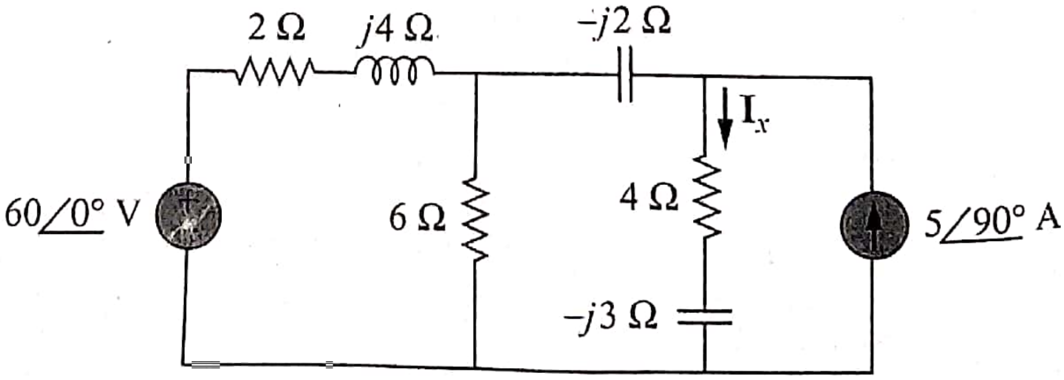

Fig. 5(a)

b) For a balanced wye-delta system, determine the expressions for all phase voltages, line voltages, phase currents and line currents for the negative sequence along with phasor diagrams. 15

a) For the circuit in Fig. 6(a), find out the values of v_0 and i_0. 10

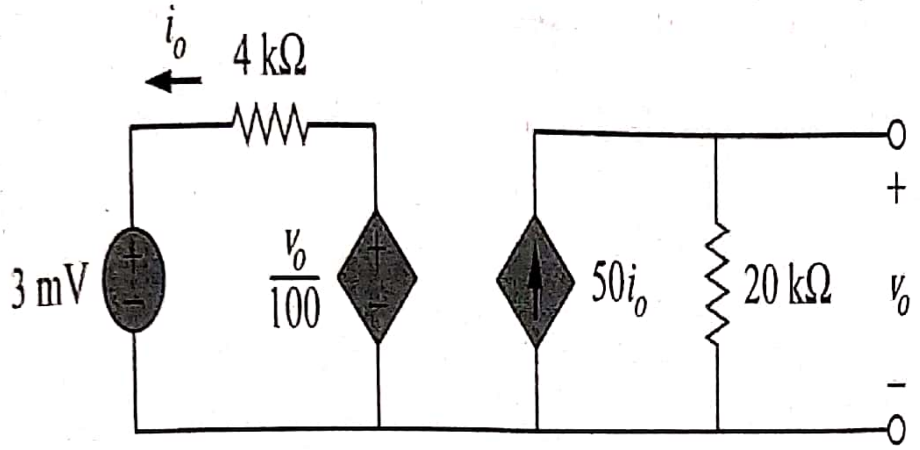

Fig. 6(a)

b) A balanced Y-connected load with a resistance of 40 Ω and reactance of 25 Ω is supplied by a balanced, positive sequence Δ-connected source with a line voltage of 210 V. Calculate the phase currents and phase voltages. Use V_{ab} as reference. 10

c) Can instantaneous power have a negative value? If yes, when and why? If not, why? 05

a) Use source transformation to calculate i_0 in the circuit of Fig. 7(a). 15

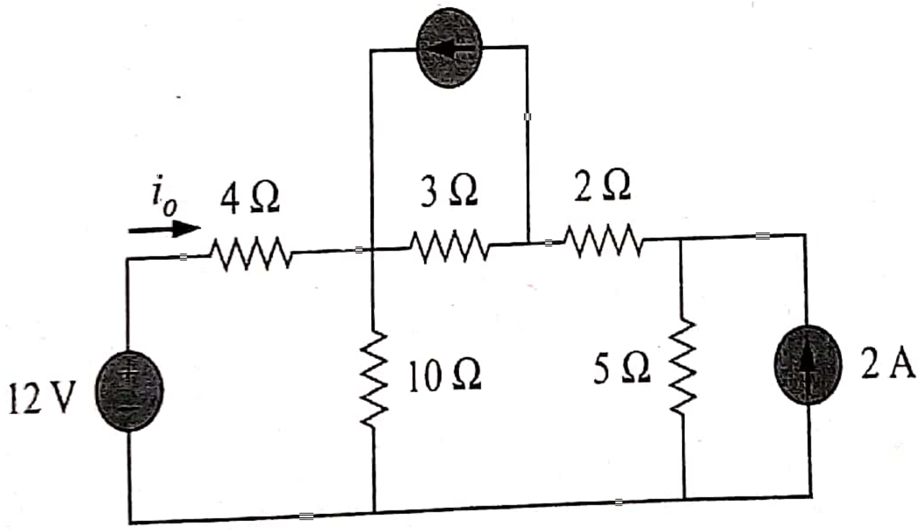

Fig. 7(a)

b) A doughnut shaped core of an unknown material having a relative permeability of 877.56 has been wounded with copper wires. The inner radius of the doughnut is 0.21 m and the outer radius is 0.39 m. A magnetizing force of 150 At/m has been applied to the core which has produced a flux of magnitude 4.5×10^{-4} Wb. Determine the magnitude of the current induced and the total number of turns. 10

8. a) Assume you have 5 electric bulbs each with 60 W capacities to enlighten a badminton court. The supply is 220 V dc. You can connect them in series, in parallel or a hybrid between these two. Of these three possible connections, which one would you choose and why?

b) Determine the value of i in the circuit of Fig. 8(b).

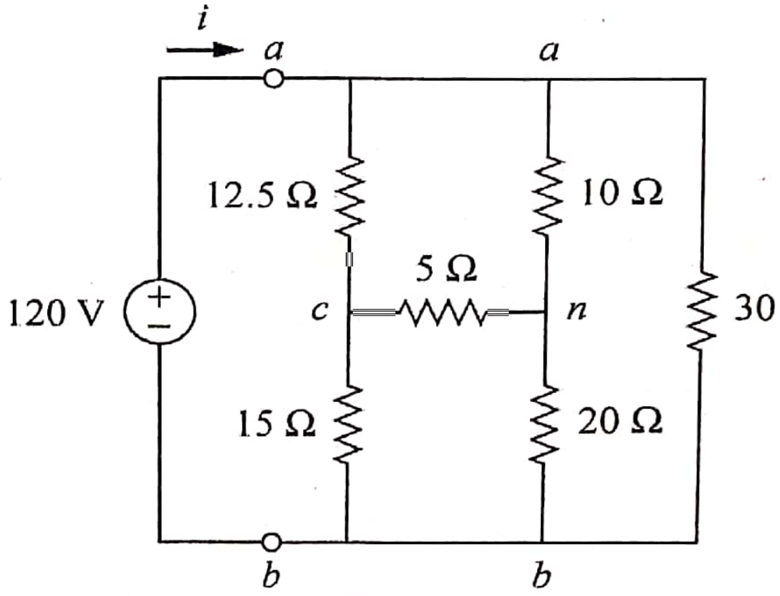

Fig. 8(b)