PYC

16 Series

Use separate answer script for each section.

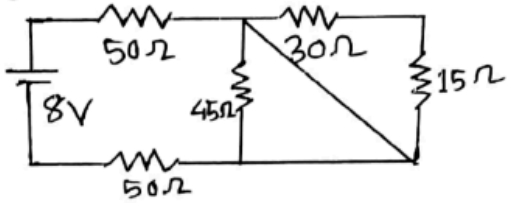
SECTION-A

Q1. (a) Define electrical circuit? Draw the resistance versus temperature graph. **4**

(b) A 1200 watt hair dryer plugged into a 120 volt circuit. What is the current drawn by the hair dryer? **3**

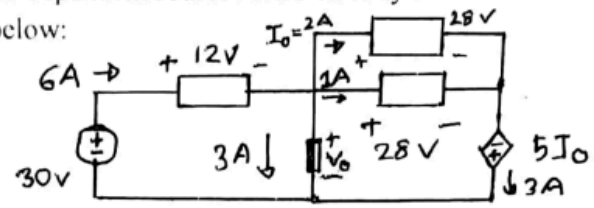
(c) A 95 watt TV is plugged into a 115 volt circuit. The TV operates for 120 minutes. If the cost of energy is 5 BDT per KW-hr, how much does it cost to run the TV for 120 minutes? **3**

(d) Determine the current through the resistances of the following circuit. **2**

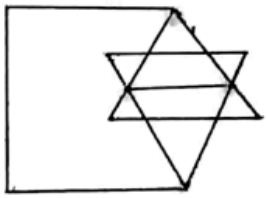


Q2. (a) Define independent and dependent source? Also classify them. **3**

(b) Find v_0 in the circuit below: **4**

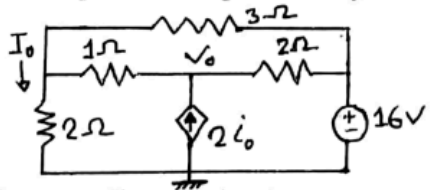


(c) What are the conditions of short circuit and open circuit? Determine the number of branches and nodes of the following figure: **5**

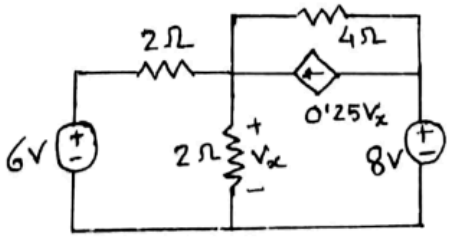


Q3 (a) What is planar and non-planar circuit? How non-planar circuits can be handled? **3**

(b) Find V_0 and I_0 in the following circuit using mesh analysis. **4**

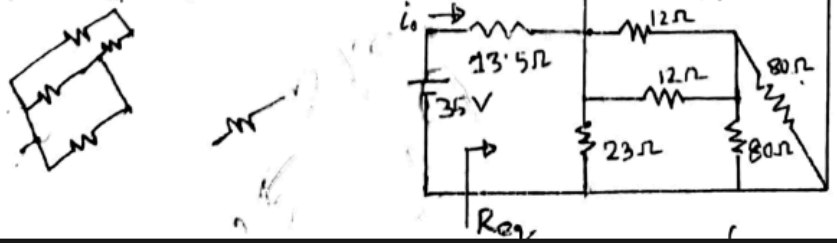


(c) State superposition theorem. Find V_x in the following figure using source transformation. **5**



Q4 (a) Write short notes on KVL, KCL, VDR, and CDR. **4**

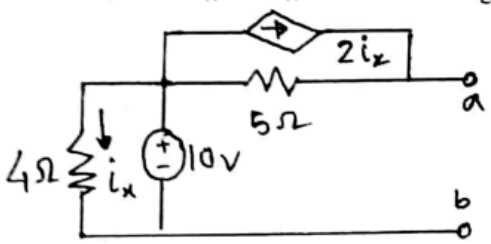
(b) Find R_{eq} and i_0 in the circuit below. **4**



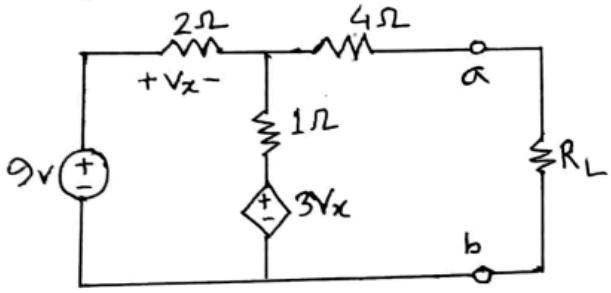
SECTION-B

Q5. (a) State maximum power transfer theorem. Prove that $P_{max}=V_{Th}^2/4R_{Th}$; where symbols have their usual meaning. **4**

(b) Using Norton's theorem, Find R_N and I_N of the following circuit at terminals a-b. **4**

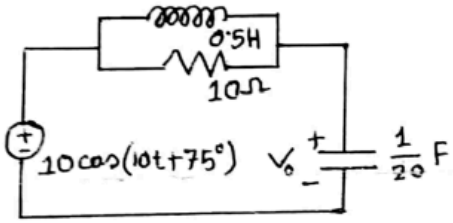


(c) Find the value of R_L for maximum power transfer in the circuit given below. Also calculate maximum power. **4**

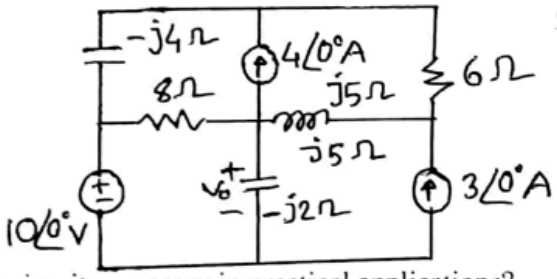


Q6. (a) What is phasor? Determine the voltage-current phasor relationship for circuit element L with phasor diagram. **4**

(b) Calculate V_0 in the circuit given below: **3**



(c) Solve for V_0 in the following circuit using mesh analysis. 5



Q7. (a) Why is resonant circuit necessary in practical applications? 1

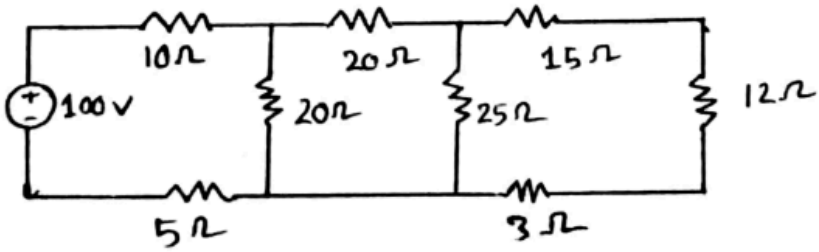
(b) Derive the expressions of resonant frequency, Quantity factor, and bandwidth for a series resonant circuit. 6

(c) A series RLC circuit has the values, R=10Ω, L=0.01H, C=100μF. Calculate resonant frequency, quality factor, bandwidth and half power frequencies. 5

Q8. (a) What is Fourier transform? What are the differences between Fourier Transform and Fourier Series? Determine the Fourier transform of one cycle of a sine wave, $f(t)=A \sin \omega_0 t$. 6

(b) What does the word 'PSpice' stand for? 1

(c) Write a PSpice program to analyze the following circuit. 5



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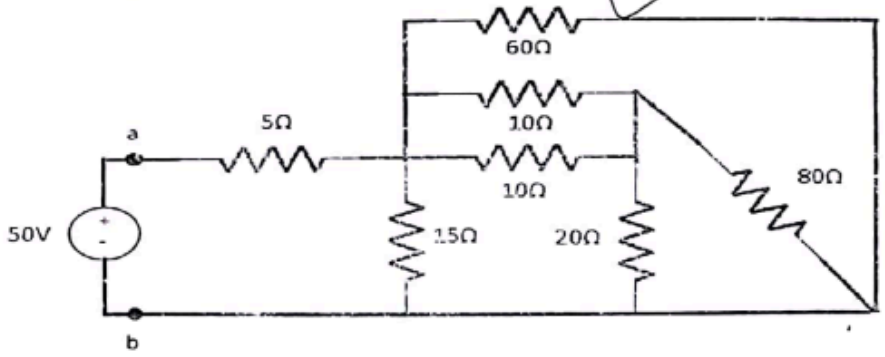
$R_L = \frac{V_{Th} R_{Th}}{R_{Th} + R_L}$

17 Series

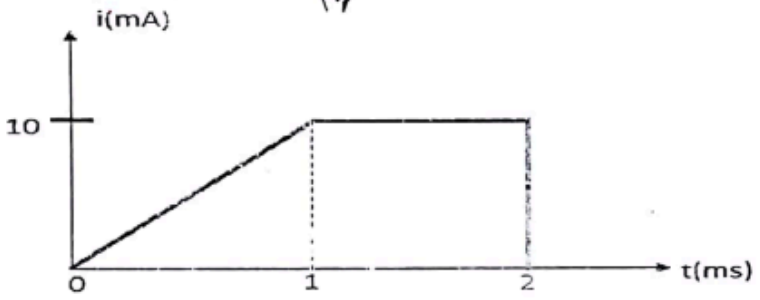
SECTION : A

Q.1. (a) Explain Voltage Divider Rule and Current Divider Rule with example. 4

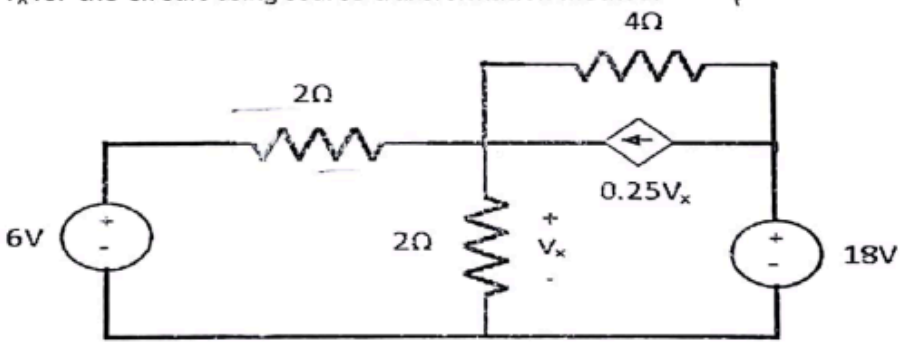
(b) Find the equivalent conductance for the circuit (a-b). 4



(c) The current flowing past a point in a device shown in figure below. Calculate the total charge through the point. 4

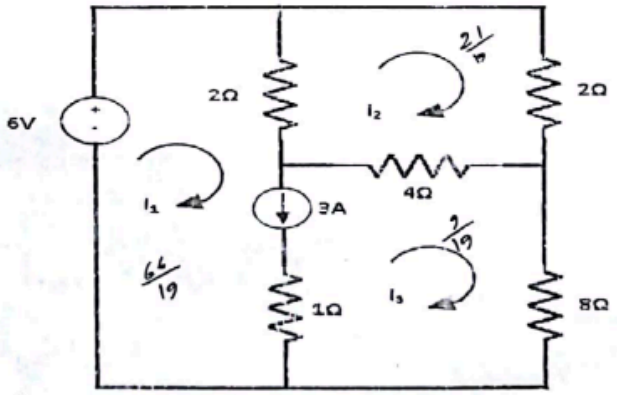


Q.2. (a) Find V_x for the circuit using source transformation method. 4



(b) Use mesh analysis to determine i_1, i_2 and i_3 from the circuit of the following figure. 5

(b) Use mesh analysis to determine i_1, i_2 and i_3 from the circuit of the following figure. 5

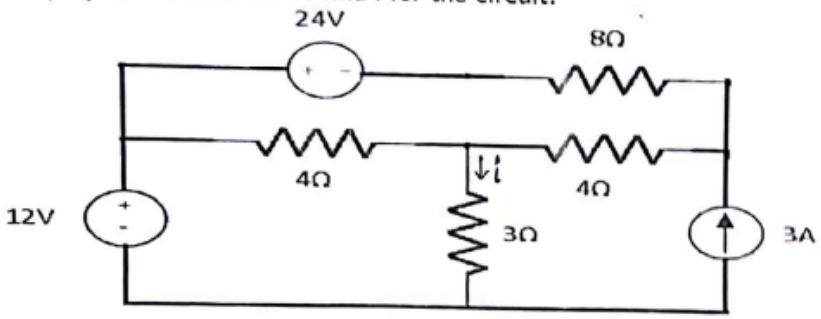


(c) What are the supernode and supermesh? Give one example for each. 3

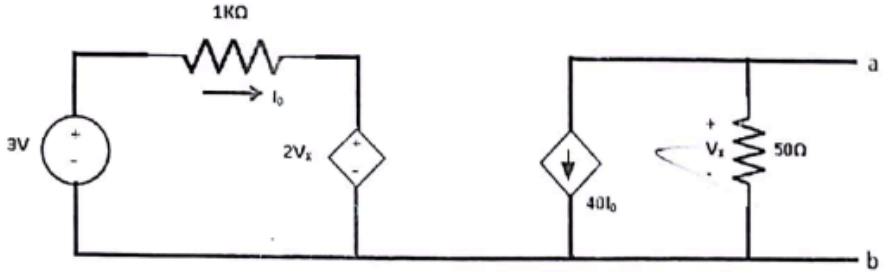
Q.3. (a) Explain linearity property of a circuit. 3

(b) State superposition theorem. Also write down the steps to apply superposition theorem. 5

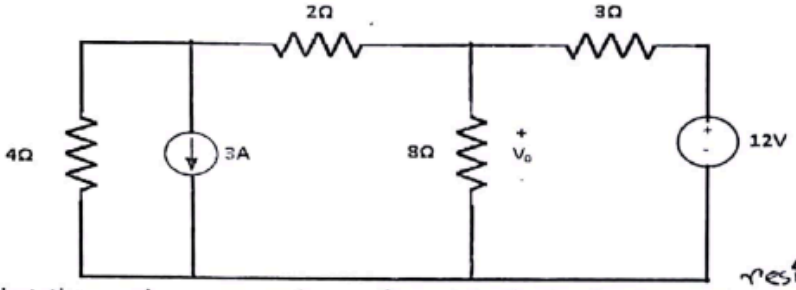
(c) Use the superposition theorem to find i for the circuit. 4



Q.4. (a) Find the Thevenin's and Norton's equivalent circuit across the terminals a-b for the following network. 4



(b) Use source transformation to find V_0 in the circuit below. 4



(c) Prove that the maximum power is transformed to the load when load ~~resonance~~ resistance is equal to the Thevenin's equivalent resistance. 4

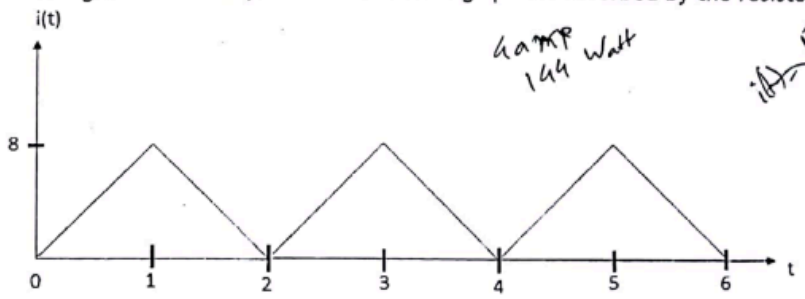
SECTION : B

Q.5. (a) Evaluate the following complex numbers: 2

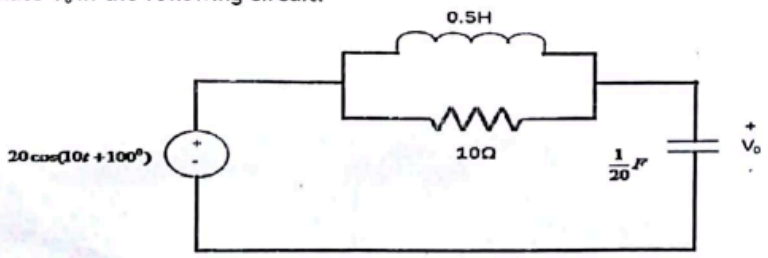
(i) $-4\sin(300t - 60^0)$ (ii) $\dfrac{(40\angle 50^0 + 60 - J50)^{\frac{1}{2}}}{(2+J4)(3-J5)^*}$

(b) Define RMS value. Why is it necessary to know? 2

(c) Find the rms value of the current waveform in the following figure. If the current flows through a 9Ω resistor, calculate the average power absorbed by the resistor. 4



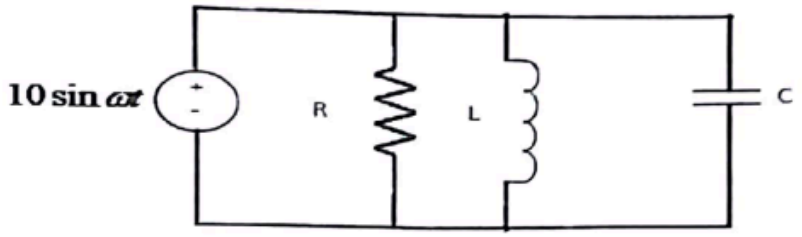
(d) Calculate V_0 in the following circuit. 4



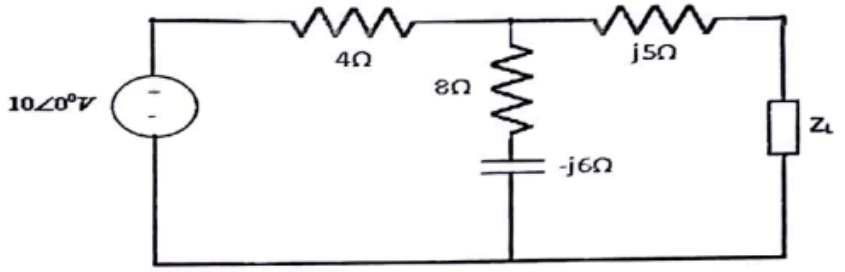
Q.6. (a) Define resonance and quality factor. State the characteristics of a series resonance circuit. 3

(b) Determine the half power frequencies for series resonance circuit. 4

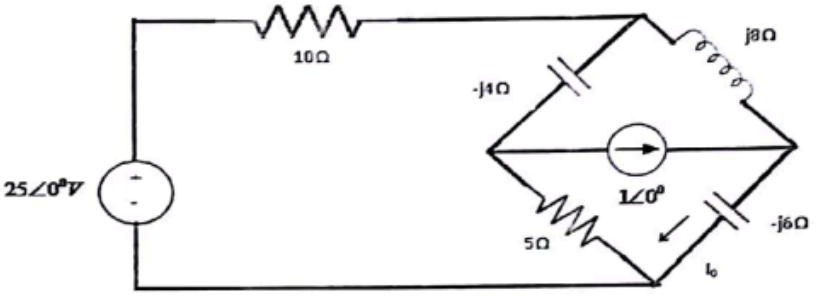
(c) If the parallel RLC circuit of the following figure, let R=8KΩ, L=0.2mH and C=8μF. Calculate $\omega_0, \omega_1, \omega_2$ and BW. 5



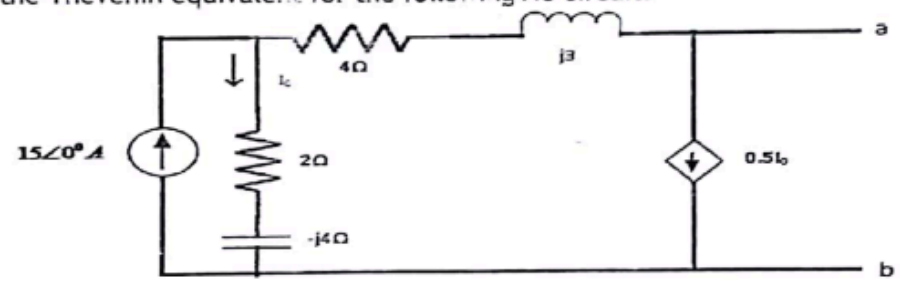
Q.7. (a) Determine the load impedance Z_L that maximizes average power drawn from the circuit of the following figure. What is the maximum average power? 4



(b) Calculate current I_0 in the circuit 4

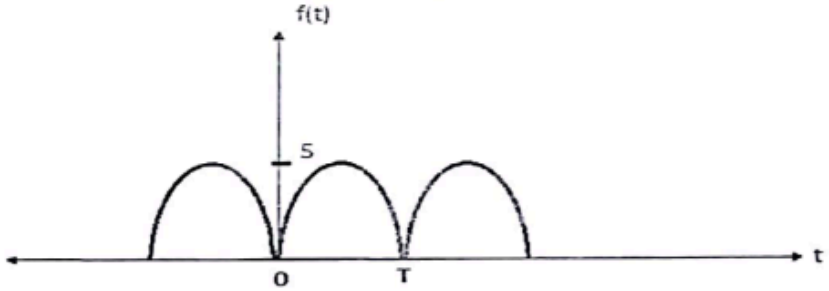


(c) Find the Thevenin equivalent for the following AC circuit. 4



Q.8. (a) What do you mean by Fourier series? Write down Dirichlet conditions. 4

(b) Find the Fourier series expression for the waveform. 5



(c) Determine Fourier co-efficient a_0 for trigonometric Fourier series where a_0 bears usual meaning. 3

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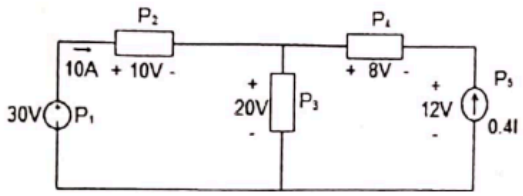
18 Series

SECTION : A

Marks

Q.1. (a) Define power and energy. A 1.2 KW toaster takes roughly 4 minutes to heat four slices of bread. Find the cost of operating the toaster once per day for one month (30 days). Assume energy costs 4TK/KWh. 4

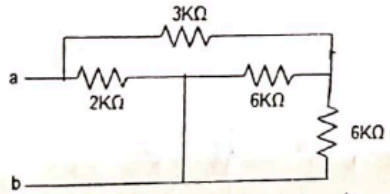
(b) Find the power absorbed by each of the elements in the following figure. 4



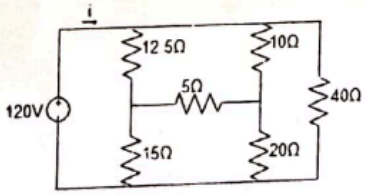
(c) Define voltage source and current source. Draw the terminal characteristics of ideal voltage source and current source. 4

Q.2. (a) For a circuit with N equal resistors of R are parallelly connected. Prove that equivalent resistance of the circuit, $R_{eq}=R/N$. 3

(b) Evaluate R_{eq} looking into terminals a-b. 4



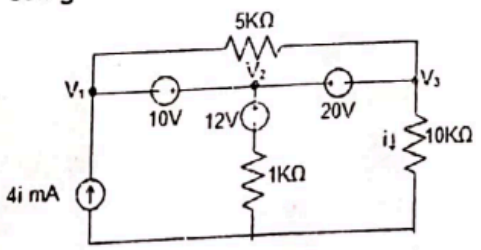
(c) Obtain i of the following circuit. 5



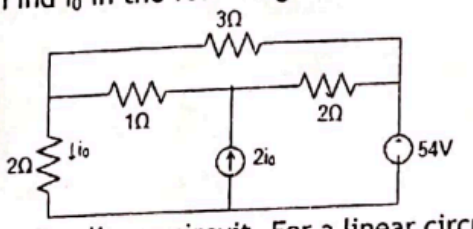
3

Q.3. (a) State and explain Kirchhoff's laws. 3

(b) Using nodal analysis, obtain the node voltages V_1, V_2 and V_3 of the following circuit. 4

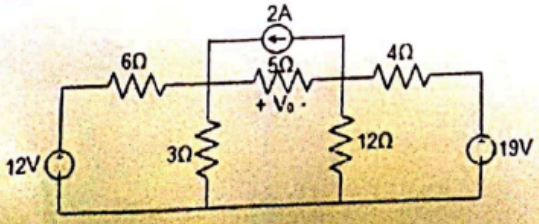


(c) Find i_0 in the following circuit using mesh analysis. 5

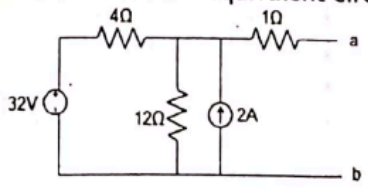


Q.4. (a) Define linear circuit. For a linear circuit, state and explain Thevenin's theorem. 3

(b) Determine v_0 in the following circuit using superposition principle. 5



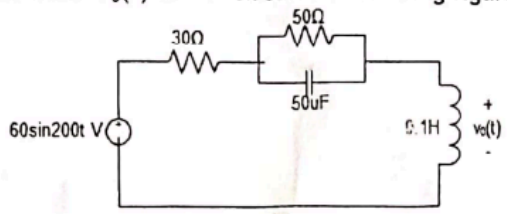
(c) Find the Norton's equivalent circuit of the circuit shown in the following figure. 4



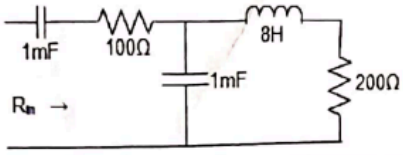
SECTION : B

Q.5. (a) What is phasor? Why phasor is used for ac analysis? 3

(b) Calculate $V_0(t)$ in the circuit of following figure using phasor. 5

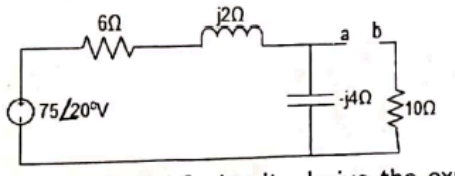


(c) Determine the input impedance of the following circuit at ω=20 rad/s. 4



Q.6. (a) Prove that for maximum average power transfer the load impedance Z_L must be equal to the complex conjugate of the Thevenin impedance Z_{th}. 5

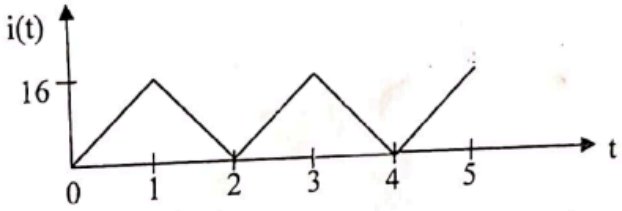
(b) Find the Thevenin equivalent at terminals a-b of the following circuit. 5



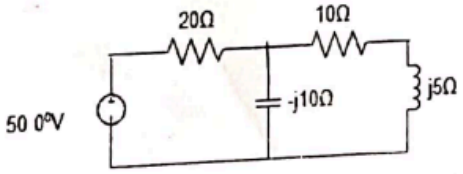
the expression of frequency for which the circuit 2

(c) For a series RLC circuit, derive the expression of frequency for which the circuit shows resonance. 2

Q.7. (a) Find the rms value of the following waveform. 4



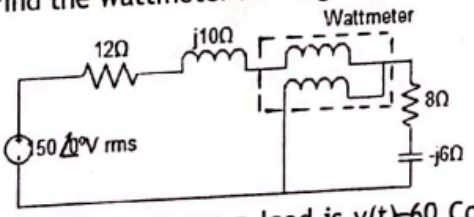
(b) Find the average power absorbed by each of the elements of the following circuit. 4



(c) Define instantaneous power. Derive the expression of instantaneous power absorbed by a load. 4

Q.8. (a) What is power factor? Write the physical significance of power factor. 2

(b) Find the wattmeter reading of the following circuit. 6



(c) The voltage across a load is $v(t)=60\ Cos(wt-10^0)V$ rms and the current through the element in the direction of the voltage drop is $i(t) = 1.5Cos(wt+60^0)A$ rms. 4

Find, (i) Complex and apparent powers
(ii) the real and reactive powers and
(iii) the power factor and load impedance.

19 Series

SECTION : A

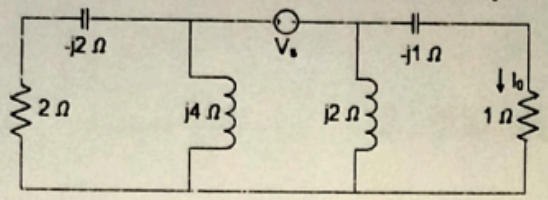
Marks

Q.1. (a) For the following pair of sinusoids, determine v_1+v_2. Also, determine which one leads and by how much. 3

(i) $v_1(t)=10Cos(4t-60^0)$

(ii) $v_2(t)=-4Sin(4t+50^0)$

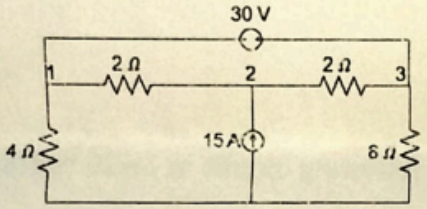
(b) In the following circuit, find V_s if $I_0 = 2\angle 0^0$ A. 4



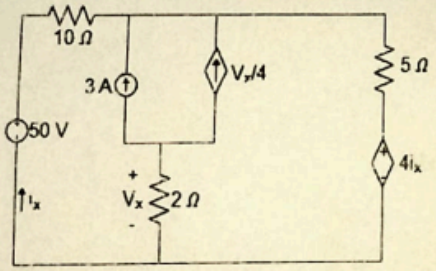
(c) Find the voltage v(t) in a circuit described by the interodifferential equation 5

$2\frac{dv}{dt}+5v+10\int vdt = 20Cos(5t-30^0)$. Using the phasor approach.

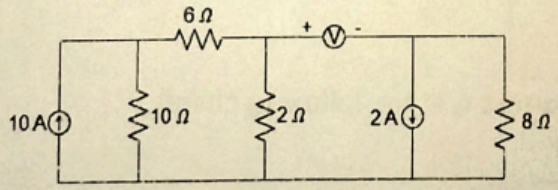
Q.2. (a) Determine the node voltages in the following circuit. 4



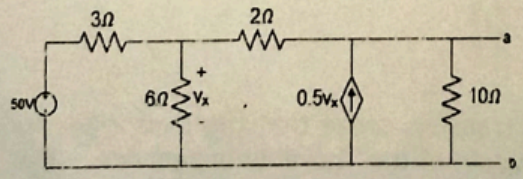
(b) Find the v_x and i_x in the following circuit. 4



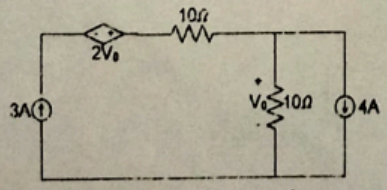
(c) Find the reading of voltmeter for the following circuit. 4



Q.3. (a) Obtain the Norton equivalent at terminals a-b for the following circuit. 6

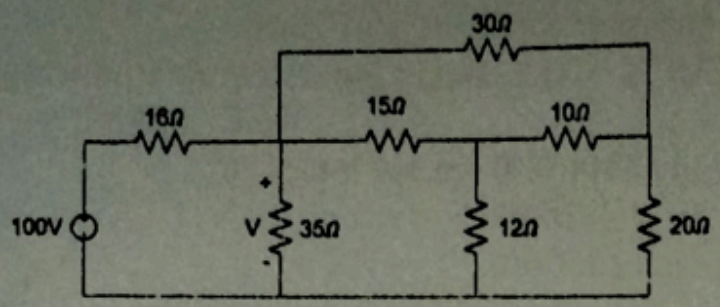


(b) Use superposition to find V_0 in the following circuit. 6

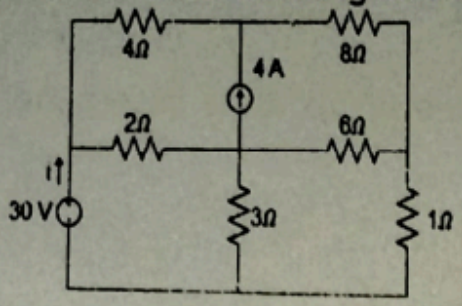


Q.4. (a) Explain the conditions for series and parallel resonance. 4

(b) Determine V in the following circuit.

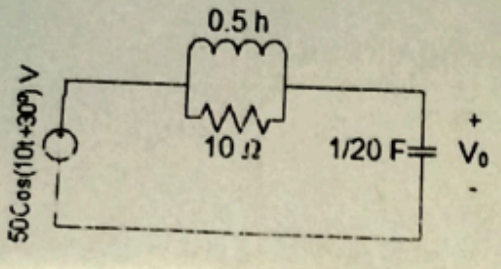


(c) Find i in the following circuit.

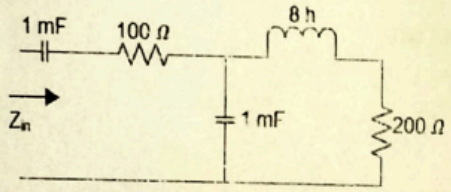


SECTION : B

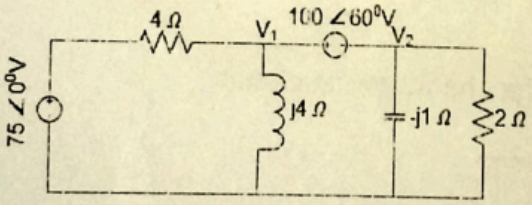
Q.5. (a) Explain voltage and current divider rule with example.
(b) Calculate V_0 in the following circuit.



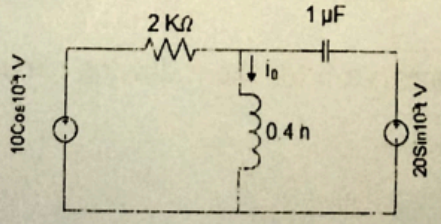
(c) Determine the input impedance of the following circuit at ω=20 rad/s. 4



Q.6. (a) Calculate V_1 and V_2 in the following circuit. 6

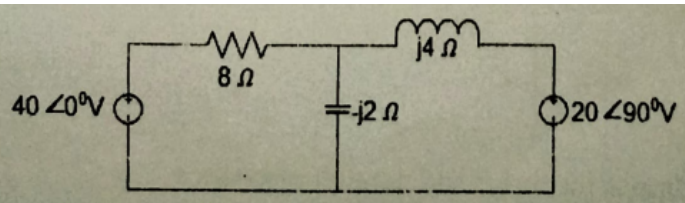


(b) Use mesh analysis to find current i_0 in the following circuit. 6



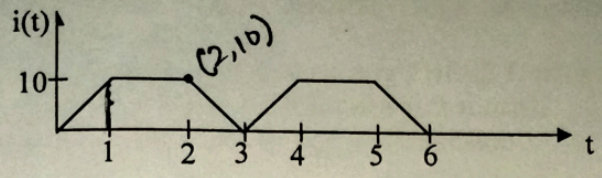
Q.7. (a) For maximum average power transfer, prove that the load impedance must be equal to the complex conjugate of the Thevenin impedance. 4

(b) Calculate the average power absorbed by each of the five elements in the following circuit. 5



(c) Determine power factor. What is the significance of power factor? 3

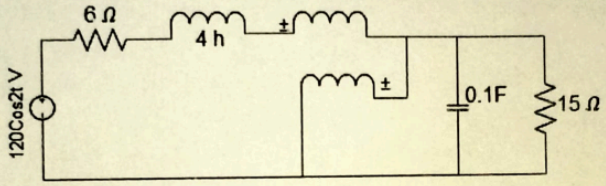
Q.8. (a) Find the rms value of current waveform of the following figure. If the current flows through a 9Ω resistor, calculate the average power absorbed by the resistor. 4



(b) For a load, $V_{rms} = 110\angle 85^0$ V, $I_{rms} = 0.4\angle 15^0$ A. Determine, 4

(i) the complex and apparent powers.
(ii) the real and reactive powers, and
(iii) the power factor and load impedance.

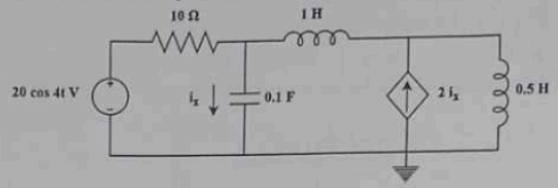
(c) Find the wattmeter reading in the following circuit. 4



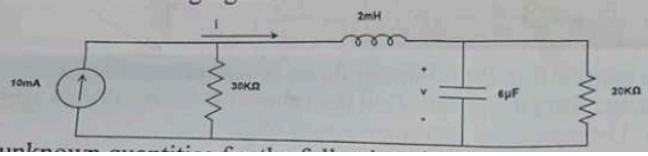
20 Series

SECTION : A

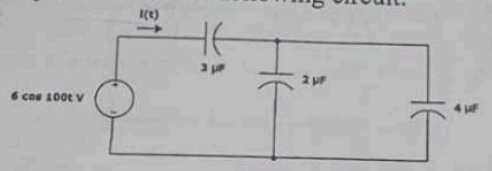
			COs	Marks
Q.1.	(a)	Explain series resonance phenomena of an electrical circuit.	CO_3	4
	(b)	A series connected circuit has $R = 2\Omega$, $L = 1\,mH$ and $C = 0.4\,\mu F$. Find resonant frequency, half-power frequencies and quality factor.	CO_3	3
	(c)	Design a RC lowpass filter with a cutoff frequency of 8 kHz. Use $R = 10\,k\Omega$.	CO_3	3
Q.2.	(a)	Explain reciprocity theorem.	CO_1	2
	(b)	Apply nodal analysis technique to find i_x in the following circuit.	CO_3	4



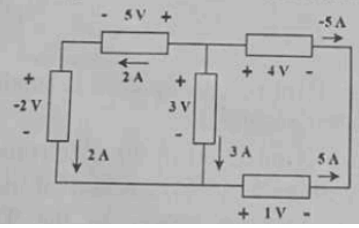
	(c)	A series connected load draws a current $i(t) = 40\cos(314t + 10°)\,A$ when the applied voltage is $v(t) = 312\cos(314t - 20°)\,V$. Find the complex power, apparent power, real power, reactive power and power factor of the load.	CO_3	4
Q.3.	(a)	Under steady-state dc conditions, find i (current through the inductor), v (voltage across the capacitor), and energy stored by inductor and capacitor in the circuit of the following figure.	CO_1	3



	(b)	Find the unknown quantities for the following circuit.	CO_1	2

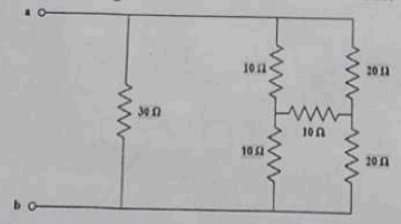


	(c)	Conservation of energy requires that the sum of the power in a circuit be zero. Following figure shows a circuit where all of the element voltage and currents are specified. Are these voltage and currents correct? Justify your answer.	CO_1	3

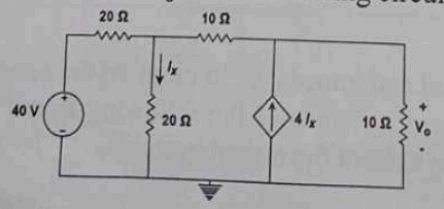


+ 1 V -

(d) Obtain the equivalent resistance at the terminals *a-b* for the circuits in the following figure. Use the concept of *Y-Δ* transformation. CO1 2

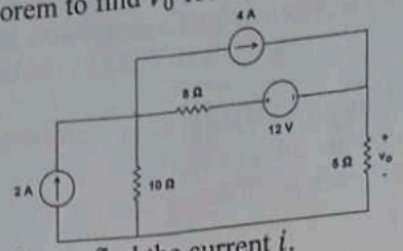


Q.4. (a) Using nodal analysis, determine V_0 in the following circuit. CO2 3



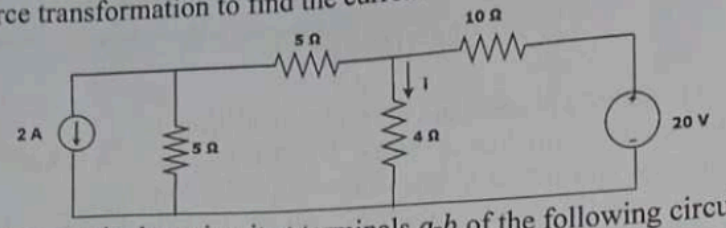
CO2

(b) Use superposition theorem to find V_0 for the following circuit.



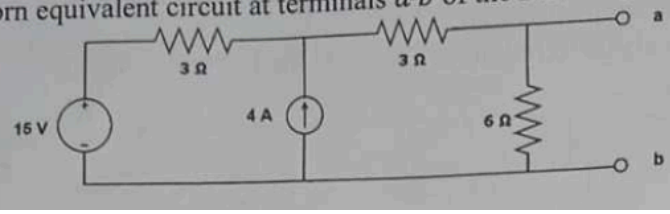
CO2

(c) Use source transformation to find the current i.



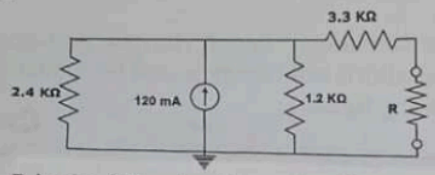
CO2

(d) Find Nortorn equivalent circuit at terminals *a-b* of the following circuit.

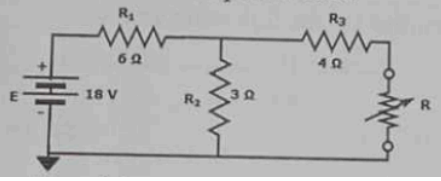


SECTION : B

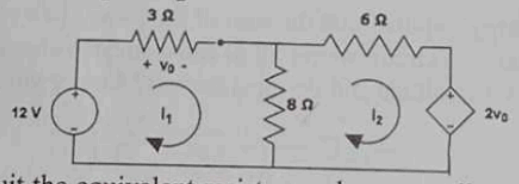
Q.5. (a) Find the The´venin equivalent circuit for the network external to the resistor R for the network in the following figure. Find the power delivered to R when R is 2 $k\Omega$ and 100 $k\Omega$. CO2 4



(b) The variable resistor R in the following figure is adjusted until it absorbs the maximum power from the circuit. Find the value of R for maximum power transfer to R. Determine the maximum power of R. CO2 3

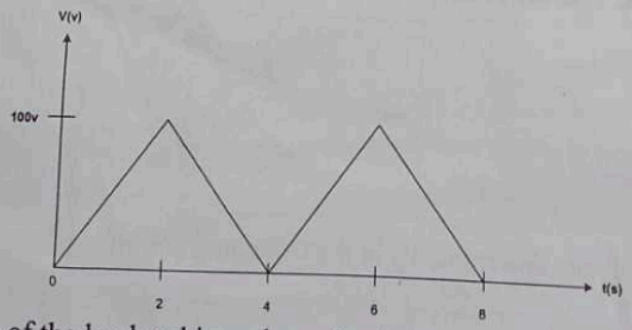


(c) Calculate mesh current i_1 and i_2. CO2 3



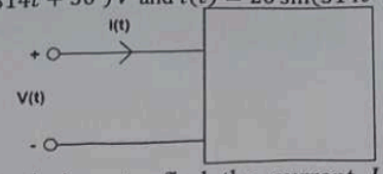
Q.6. (a) "In parallel circuit the equivalent resistance always smaller than resistance of the smallest resistor"- verify the statement. CO1 3

(b) A triangular wave generator is installed in the electronic lab to be used as a power source and output voltage waveform is shown in the following figure. Triangular wave generator supplies power to the 10 Ω resistive load. Determine the rms value of output voltage and amount power absorbs by the load. CO1 4

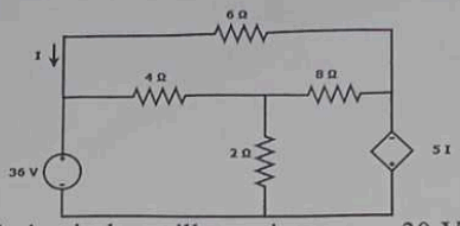


(c) Find the type of the load and impedance in ohms of the series circuit elements that must be in the closed container of the following figure for the mentioned voltages and currents to exist at the input terminals. CO1 3

i. $v(t) = 312\sin(314t + 30^{\circ})\,V$ and $i(t) = 10\sin(314t + 30^{\circ})A$
ii. $v(t) = 312\sin(314t + 30^{\circ})\,V$ and $i(t) = 15\cos(314t + 30^{\circ})A$
iii. $v(t) = 312\cos(314t + 30^{\circ})\,V$ and $i(t) = 20\sin(314t + 30^{\circ})A$



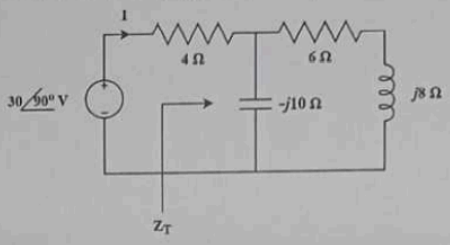
Q.7. (a) Apply mesh analysis technique to find the current I in the circuit of the following figure. CO2 4



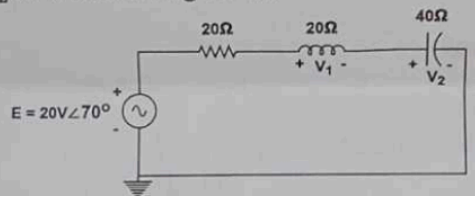
(b) Design an electrical circuit that will permit to use a 30 V, 100 mA bulb in a 36V electrical system. CO2 4

(c) Distinguish between active and passive circuit elements. CO1 2

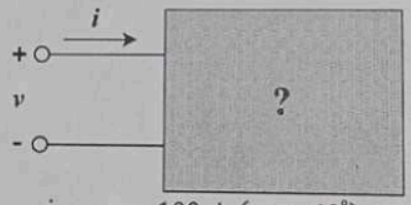
Q.8. (a) Find Z_T and I in the following circuit and draw the phasor diagram of supply voltage and current I. From the phasor diagram, find the phase difference between voltage and current. Finally, find the power factor of the system. CO3 3



(b) Calculate V_1 and V_2 of the following circuit. CO3 2



(c) For the following pairs of voltages and currents, draw the phasor diagram and determine whether the element involved is a capacitor, an inductor, or a resistor. Determine the value of C, L or R if sufficient data are provided. CO3 3



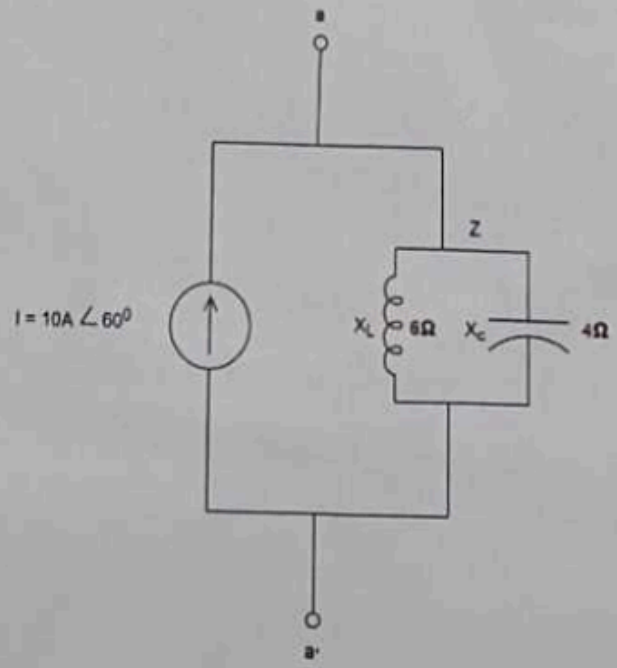
i. $v = 100\sin(\omega t + 40^\circ)$
$i = 20\sin(\omega t + 40^\circ)$

ii. $v = 1000\sin(377t + 10^\circ)$
$i = 5\sin(377t - 80^\circ)$

iii. $v = 500\sin(157t + 30^\circ)$
$i = 1\sin(157t + 120^\circ)$

$i = 1\sin(157t + 120^\circ)$

(d) Convert the current source to voltage source.

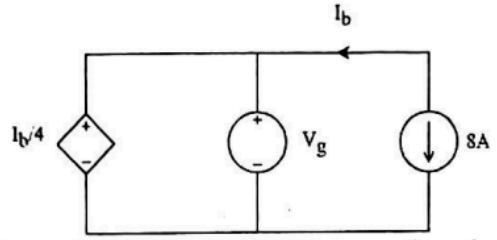


*** END ***

21 Series

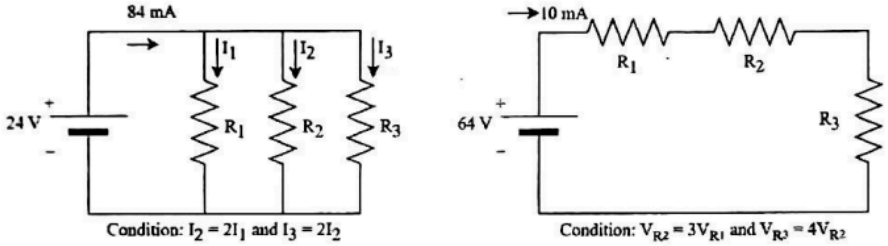
Q.1. (a) Describe active and passive circuit elements giving example of each. CO_1 2

(b) For the circuit shown in the figure, determine the value of V_g for the interconnection to be valid. CO_2 3

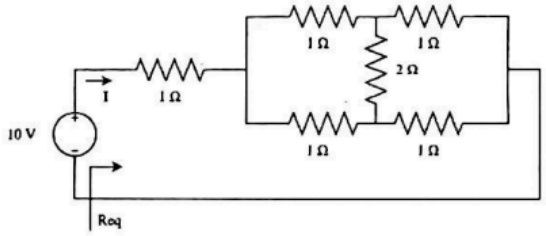


(c) Design the following networks considering the mentioned conditions. CO_1 5

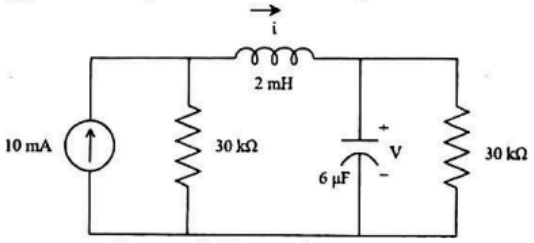
i) ii)



Q.2. (a) For the following circuit, use *Y-Δ* transformation to simplify the circuit, find R_{eq} and I. CO_1 3

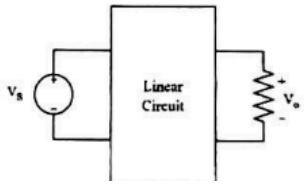


(b) Find I, V and energy stored by inductor and capacitor in the following circuit. CO_1 3

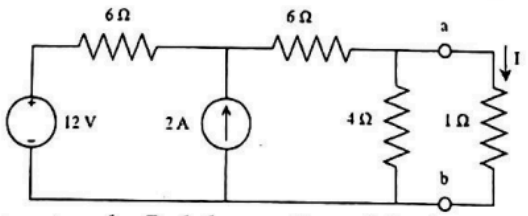


(c) Calculate the unknown values of V_s and V_o in the following experimental table for the following circuit. CO_2 4

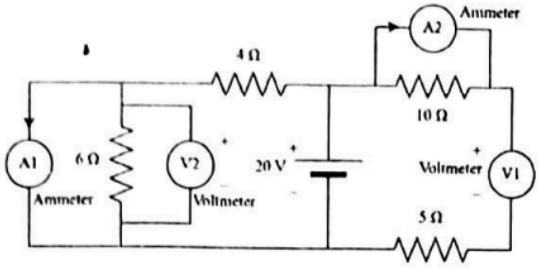
Experiment	V_s	V_o
1	12 V	4 V
2	---	16 V
3	1 V	---
4	---	-2V



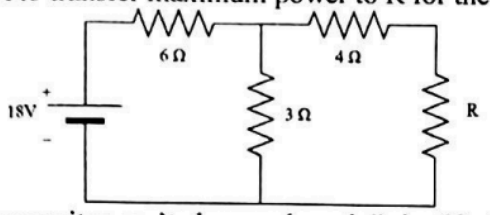
Q.3. (a) Find Norton equivalent circuit to the left of the terminals a-b in the following circuit. From the Norton circuit find the Thevenin circuit. CO_2 4



(b) For the following network, find the reading of the instruments considering as ideal instruments, CO_2 3



(c) Find the value of R to transfer maximum power to R for the following circuit. CO_2 3



Q.4. (a) "The voltage on a capacitor can't change abruptly"- justify the statement. CO_1 2

(b) For the following pairs of voltages and currents, indicate whether the element involved is a capacitor, an inductor, or a resistor and find the value of C, L, R if sufficient data are given. CO_1 3

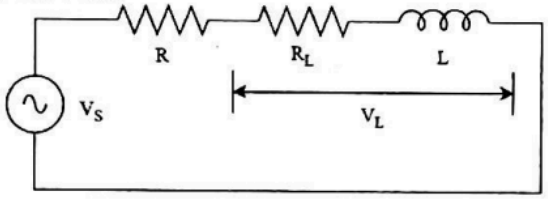
i) $v = 550\sin(377t + 50°)$
$i = 11\sin(377t - 40°)$

ii) $v = 36\sin(754t - 80°)$
$i = 4\sin(754\,t - 170°)$

iii) $v = 10.5\sin(\omega t - 13°)$
$i = 1.5\sin(\omega t - 13°)$

$i = 1.5\sin(\omega t - 15^\circ)$

(c) Determine R, R_L and L in the following circuit if V_L= 150 volts, V_S=220∠0° volts and the current in the circuit is 1.5 A with angle 55° lagging. Assume the source frequency is 50 Hz. CO_2 5

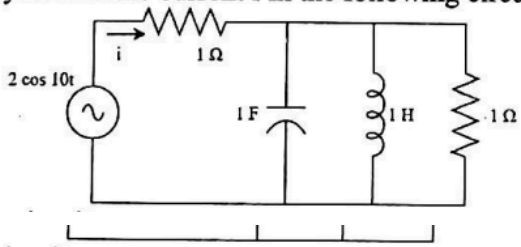


SECTION : B

Q.5. (a) State and explain superposition theorem. When is the principle of superposition inevitable? CO_1 3

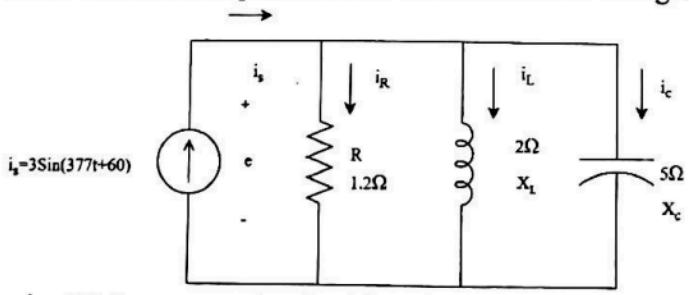
(b) Show that P=1/2 R_e[VI*], where symbols have their usual meaning. CO_2 3

(c) Using nodal analysis find the current i in the following circuit. CO_3 4



Q.6. (a) For the following circuit CO_3 5

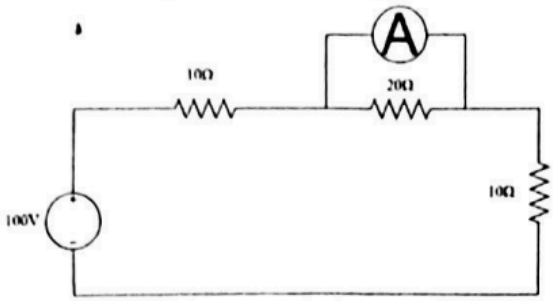
i) Find the voltage E and current I_s, I_R, I_L, and I_c.
ii) Draw the phasor of E, I_s, I_R, I_L, and I_c.
iii) Verify kirchhoff's current law.
iv) Find the power factor of the circuit with the help of phasor diagram.
v) Find the sinusoidal expressions for the currents and voltage.



(b) Design a series RLC resonant circuit with an input voltage of 5∠0° to have the following specifications. CO_3 3

- Peak current of 500 mA at resonance.
- Band width (B) of 754 rad/s.
- Resonant frequency (ω_o) of 52.8 krad/s

(c) Determine the ammeter reading in the following circuit. CO_2 2



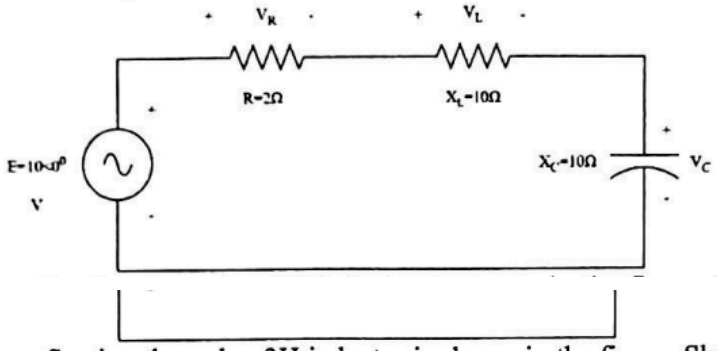
Q.7. (a) Using two 10K resistors, design a RC bandpass filter with a resonant frequency of 6 kHz and a bandwidth of 9 kHz CO_3 4

(b) For the following series resonant circuit, calculate I, V_R, V_L, and V_c at resonance. From this circuit also find: CO_3 6

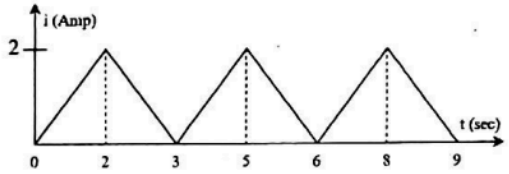
i) Q_s of the circuit

ii) If the resonant frequency is 5000 Hz, find the bandwidth.

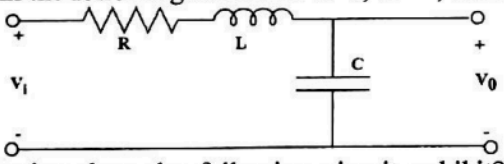
iii) The power dissipated in the current at the half-power frequencies.



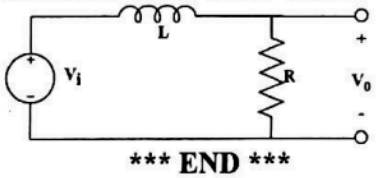
Q.8. (a) The current flowing through a 3H inductor is shown in the figure. Sketch the voltage across the inductor over the interval 0<t<6sec. CO_2 4



(b) Determine V_o/V_i in the following circuit for $\omega=0$, $\omega=\infty$, and $\omega^2 = 1/LC$. CO_3 2



(c) What type of filtering does the following circuit exhibit? Find the cutoff frequency of the filter in Hz if R=330Ω and L=10mH CO_3 4

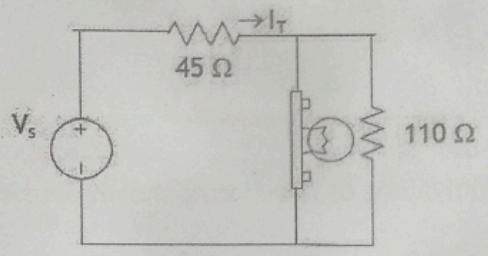


*** END ***

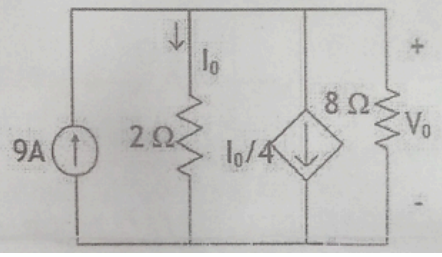
22 Series

Q.1. (a) What do you understand by ideal and practical electrical sources? Explain with necessary circuit diagram. 2 CO1 PO1

(b) The bulb in the following circuit is rated at 220V, 2A. Find the total current, I_T and the supply voltage, V_s if the bulb is operating at its rated condition. 4 CO2 PO2



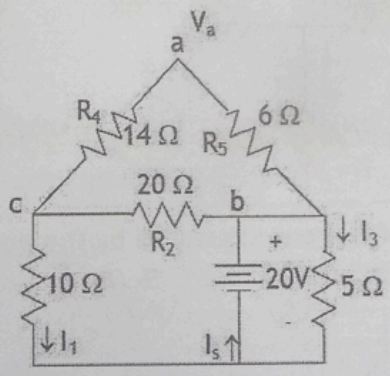
(c) Find I_0 and V_0 in the circuit shown below. 4 CO2 PO2



Q.2. (a) For the following network: 3 CO1 PO1

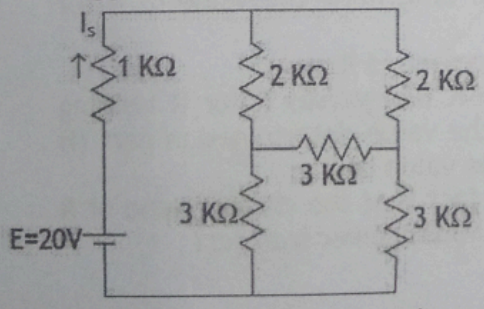
(i) Determine the currents I_s, I_1, and I_3.

(ii) Calculate V_a and V_{bc}.

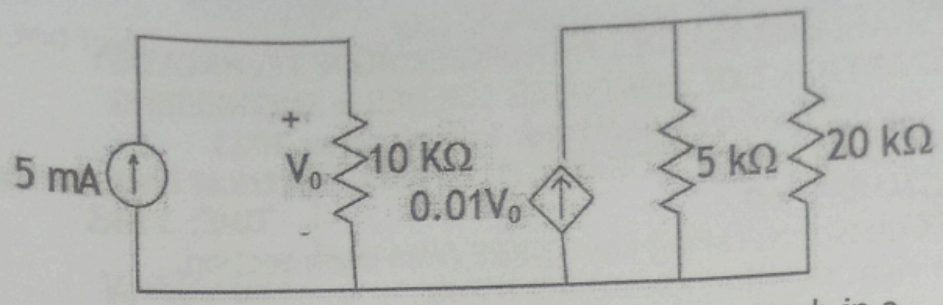


(b) (i) Using a $\Delta - Y$ and $Y - \Delta$ conversion, find the current I_s in the following network. 4 CO1 PO1

(ii) What other method could be used to find the current I ? Use your suggested method and verify the result obtained in (i).

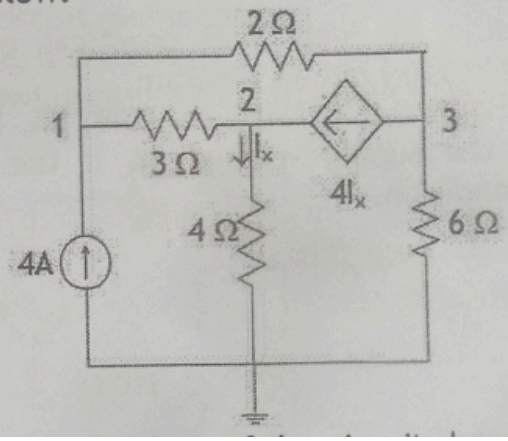


(c) The following circuit contains a dependent source. Determine the value of current, voltage, and power associated with the 20KΩ resistor and the dependent source. 3 CO1 PO1

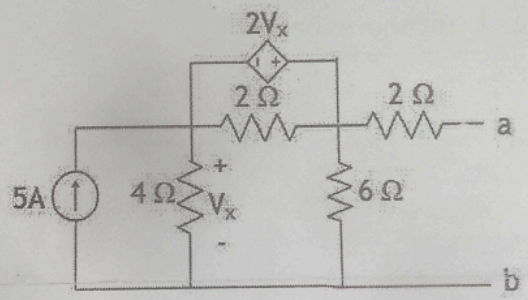


Q.3. (a) What do you understand by super node and super-mesh in a circuit? 2

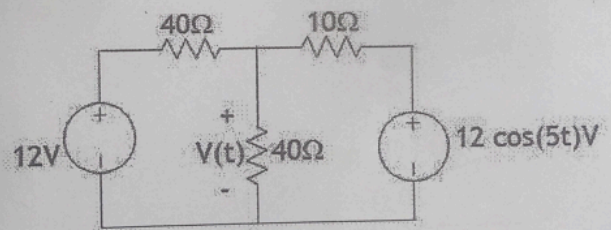
(b) Find the voltages at the three non-reference nodes in the circuit shown below. 4



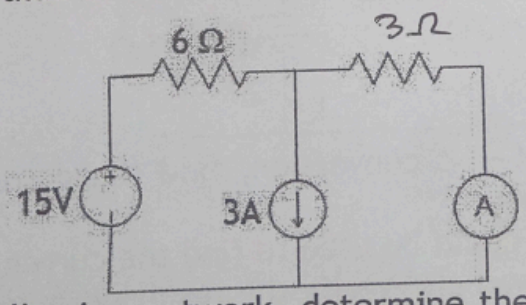
(c) Find the Thevenin equivalent of the circuit shown below at terminals a-b. 4 CO2 PO2



Q.4. (a) Determine v(t), the voltage across the vertical resistor (40Ω) in the circuit of the following figure. 3 CO2 PO2



(b) Determine the value of current measured by the ammeter. 3

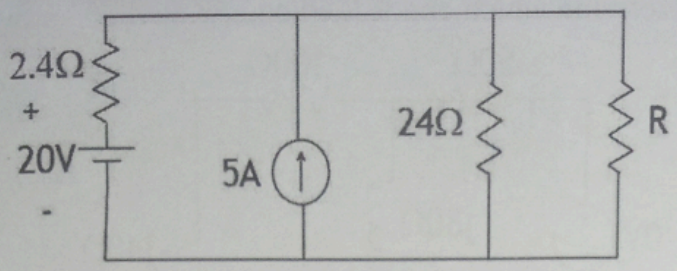


(c) (i) For the following network, determine the value of R for maximum power to R. 4

(ii) Determine the maximum power to R.

(iii) Plot a curve of power to R (P_R) versus R for R ranging from ¼ times to 2 times the value determined in part (i) with an increment of ¼ the value of R.

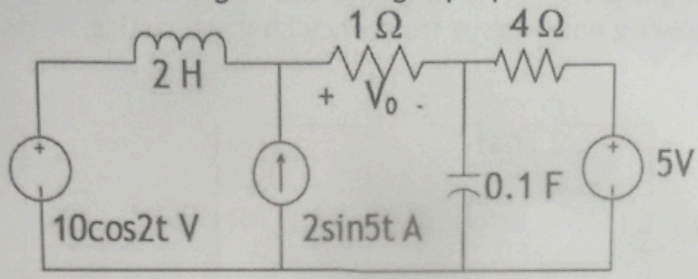
(iv) Does the curve verify the fact that the chosen value of R in part (i) will ensure maximum power transfer?



SECTION : B

Q.5. (a) State superposition theorem. 2 CO1 PO1

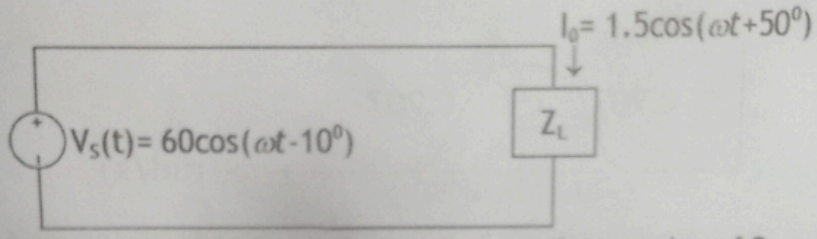
(b) Find V_0 in the following circuit using superposition theorem. 4 CO2 PO2



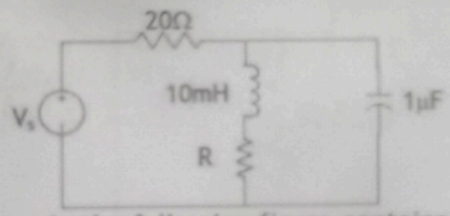
(c) Find the load impedance, Z_L in the following circuit. Also calculate the real power, reactive power, apparent power, and power factor of the circuit. 4 CO3 PO2

$I = 1.5\cos(\omega t + 50^0)$

power factor of the circuit.



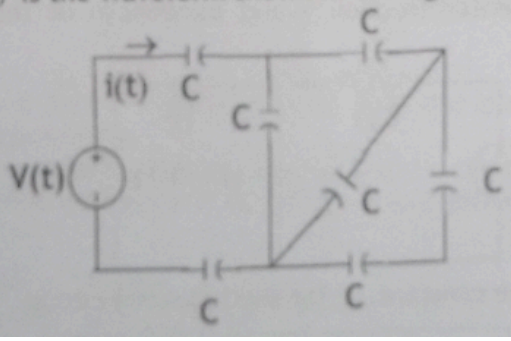
Q.6. (a) For the circuit shown in following figure, select a value of R so that the energy stored in the inductor is equal to the energy stored in the capacitor at steady state. 3 CO3 PO3

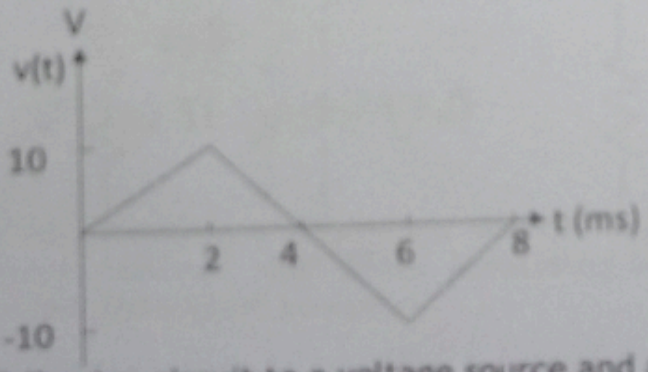


(b) The circuit shown in the following figure contains seven capacitors, each having capacitance C and C=1F. Find the current i(t) and draw the waveform when: 4 CO3 PO3

(i) $v(t) = 4\cos(3t)V$

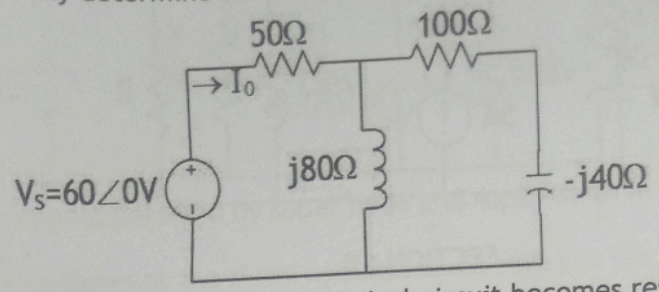
(ii) $v(t)$ is the waveform shown in the figure.





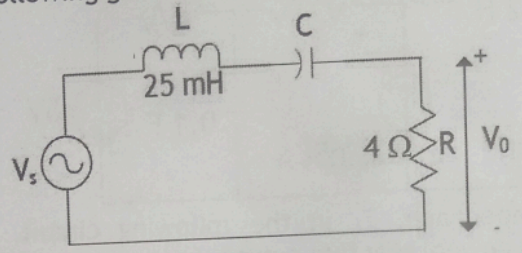
(c) Reduce the following circuit to a voltage source and a single impedance. Also find I_0 and draw the phasor diagram of V_s and 3

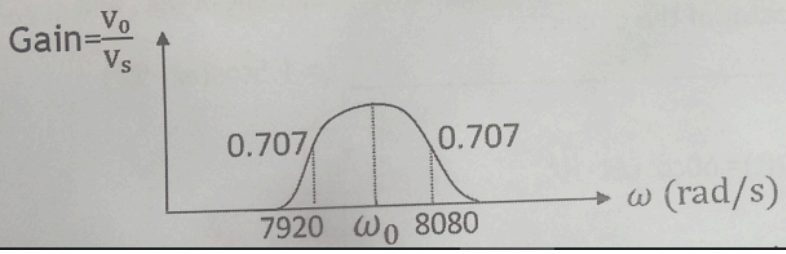
I_0 and finally determine which one is leading.



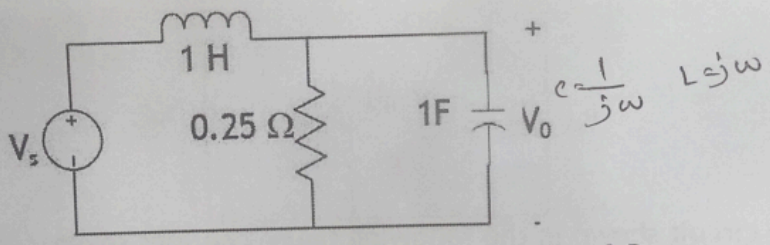
Q.7. (a) State with equations how an electrical circuit becomes resonant in terms of its circuit elements. 2 CO1 PO1

(b) For the following R-L-C circuit, calculate the value of C that results the following gain versus frequency characteristics. 4 CO3 PO3



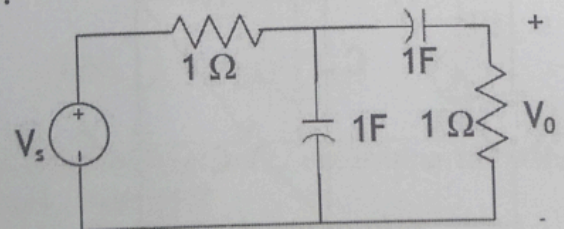


(c) Show that the following circuit is a low-pass filter. Obtain the expression of its gain function, $\frac{V_0}{V_s}$ in terms of angular frequency ω. 4 CO3 PO3

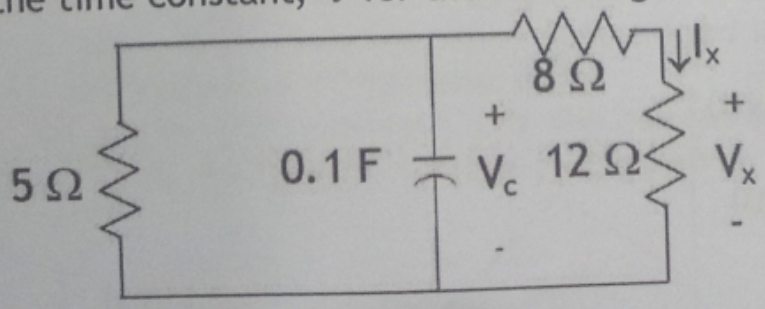


Q.8. (a) What do understand by the center frequency of a filter? Draw a band-pass filter and obtain the expressions of center frequency, upper cutoff frequency and lower cutoff frequency in terms of the circuit elements. 4 CO1 PO1

(b) Determine the center frequency and bandwidth of the filter shown below. 4 CO2 PO2



(c) Calculate the time constant, τ for the following circuit.



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