TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2076 Chaitra

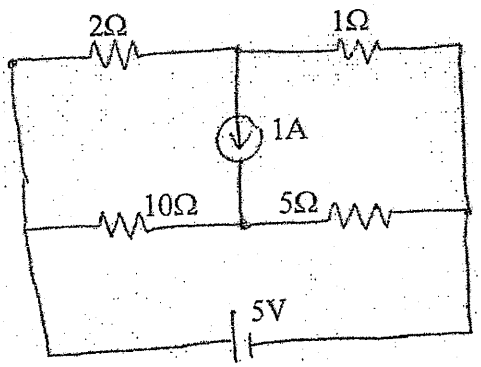
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BEI, BCT, BAM, BIE, BAG, BAS, BCH	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE 401)*

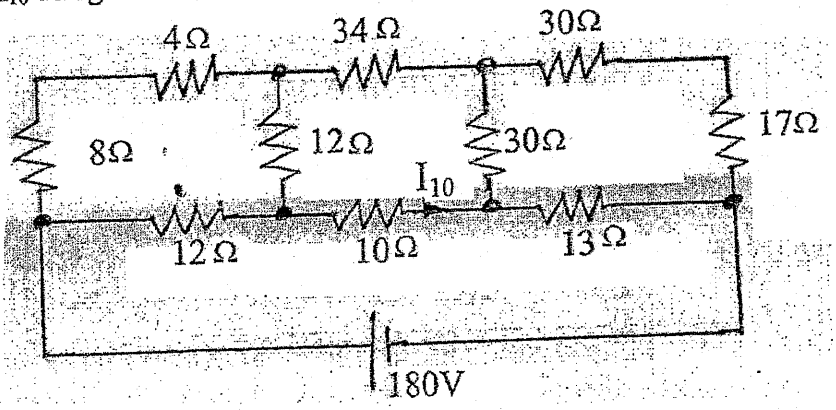
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. a) What do you mean by ideal and practical voltage source? Explain the effect of an internal resistance of voltage and current sources on their terminal characteristics. [4+4]

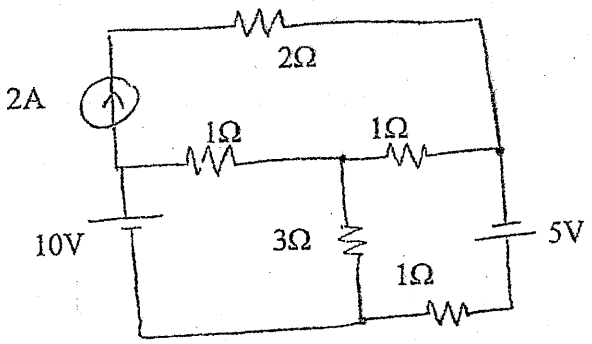
   b) Using loop current method, determine the current through 5Ω resistor in the circuit below. [8]



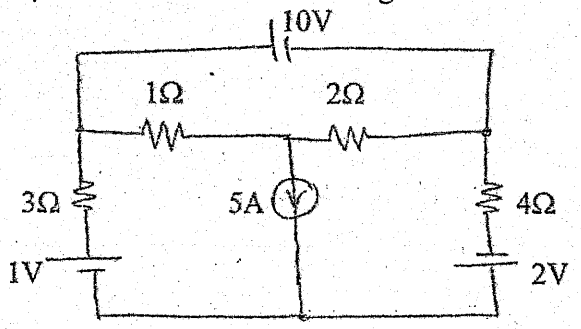
2. a) Find the I_{10} using Y/Δ transformation method, in the network given below. [8]



   b) Find the current though 3Ω resistor using Thevenin's theorem. [8]



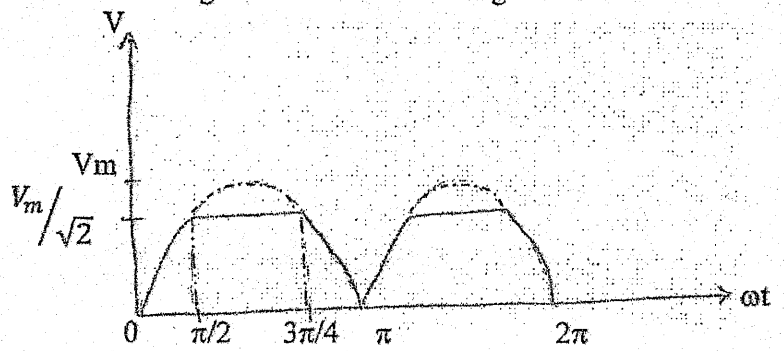
3. a) Using Nodal analysis, determine the current through 2Ω resistor in the circuit below. [8]



b) What is a self inductance? Derive the expression of equivalent inductance, when the two inductances are connected in series (opposing). [4]

c) "The average power over complete cycle in a purely inductive circuit is zero". Justify with necessary waveforms and mathematical expression. [4]

4. a) Find the rms and average value of the following waveform. [8]



b) Two coils A & B are connected in series across a 230V, 50Hz ac supply. The resistance and inductance of coil A & B are 5Ω and 0.018H respectively. The input from the supply is 2KW and 2kVAR, find the inductance of coil A and resistance of coil B. Also calculate the voltage across each coil. [8]

5. a) A two wattmeters measured an input power of 30KW and 40KW respectively to a motor. If the power factor of the motor be changed to 0.85 leading, determine the two wattmeter readings. The total input power remains the same. Draw a phasor diagram for the second condition. [8]

b) Three loads 4-3j, 6+8j, and 8+6j are connected in delta to a 3-phase, 400V supply. Find phase currents, line currents and total power consumed. [8]

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INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
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Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE 401)*

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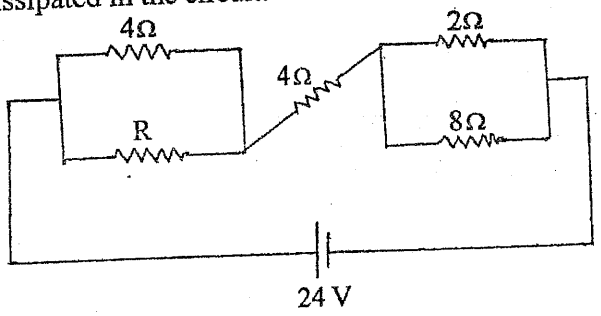
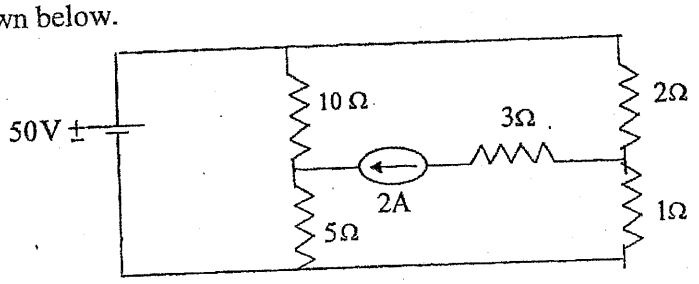
1. a) Discuss on brief voltage and current sources. Also justify the statement "terminal voltage goes on increasing on decreasing load current". [4]

   b) The resistance of the certain length of wire is 4.60 ohm at 20°C and 5.68 ohm at 80°C. Determine (i) the temperature coefficient of resistance of the wire at 0°C, (ii) the resistance of the wire at 60°C. [6]

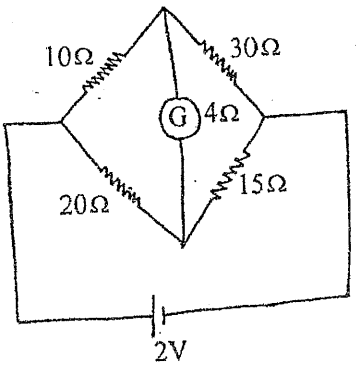
   c) State and explain Kirchoff's current laws. Determine the value of unknown resistance R and the total current drawn from the source in the circuit of figure. Also compute the total power dissipated in the circuit. [6]



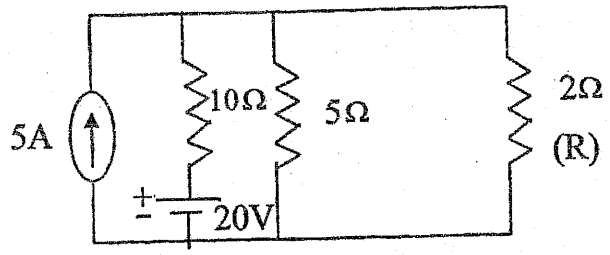
2. a) Use loop current method to calculate the current through the 5 Ω resistance for the network shown below. [8]



   b) Using delta/star transformation, find the galvanometer current in the Wheatstone bridge. [8]

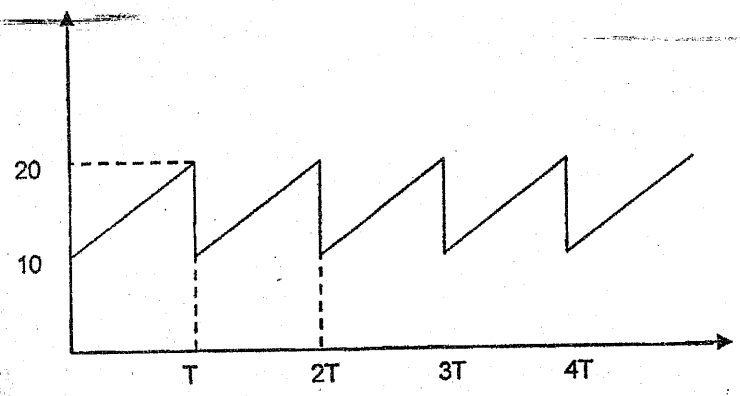


3. a) Find the current through R using thevenin's theorem. Also, find the value of R such that maximum power transfer takes place from the source to R in the network shown below. [8]



b) Derive an expression for the equivalent capacitance of a group of capacitors when they are connected in series. [4]

c) Calculate the form factor and peak factor of the following waveform. [4]



4. a) State and explain Norton's theorem with a suitable example. [4]

b) A resistance of 12 Ω, an inductance of 0.15 H and a capacitance of 130 μF are connected in series across a 100V, 50Hz supply. Calculate the impedance, current and phase angle and power factor. [4]

c) A parallel circuit consists of two branches, one containing a coil of resistances 5 Ω and inductance 38.2mH, the other a non-inductive resistance 16 Ω in series with a capacitor of 300 μF capacitance. The circuit is connected to a 240 V, 50 Hz supply. Determine (i) the current in each branch (ii) the total current (iii) the circuit phase angle (iv) the circuit impedance (e) the components of an equivalent circuit consisting of a resistance and reactance. [8]

5. a) Define power factor and explain causes of low factor. A single phase 240V, 50 Hz induction motor takes 20A at power factor of 0.75 lagging. It is desired to raise the power factor to 0.95 lagging by connecting a capacitor across the load. Calculate the capacitance of the capacitor to be used in parallel with induction motor. [2+6]

b) A three phase 400 V, 50 Hz power line has two loads connected to it. The first is delta-connected and draws 25 Kw at 0.70 power factor lagging. The second is wye-connected and draws 6.25 kVA at 0.8 power factor leading. What is the total line current and the combined power factor. [8]

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Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE 401)*

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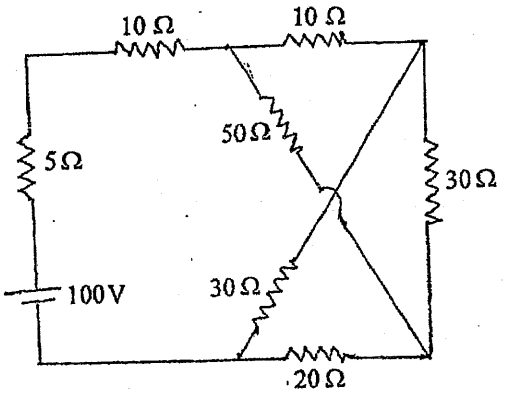
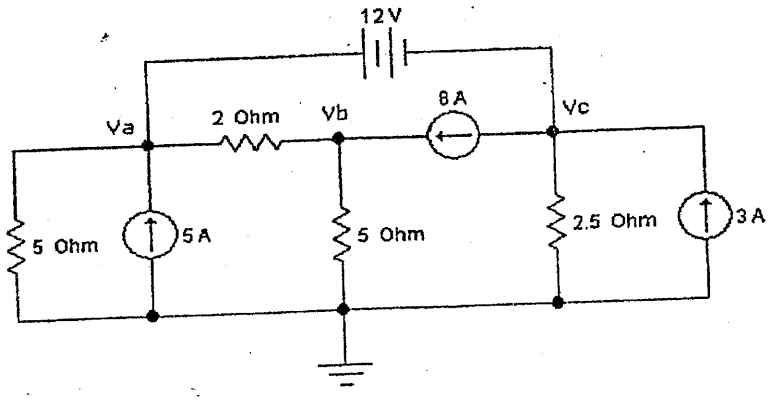
1. a) What are ideal and practical voltage and current source? Explain. [4]

   b) A coil has a resistance of 18 Ω when its mean temperature is 20°C and of 20 Ω when its mean temperature is 50°C. Find its mean temperature rise when its resistance is 21 ohm and the surrounding temperature is 15°C. [6]

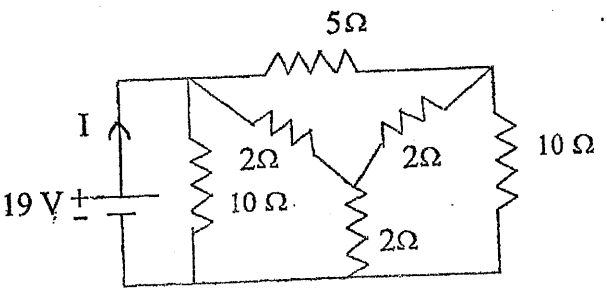
   c) State and explain Kirchoff's voltage laws. Determine the current supplied by the battery in the circuit shown in figure below. [6]



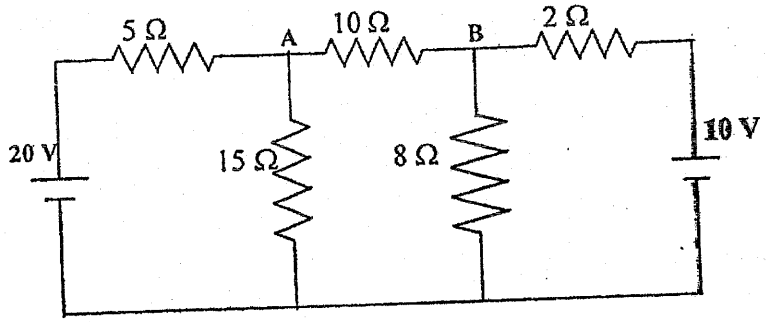
2. a) Use Nodal Analysis Method to determine the V_a, V_b and V_c and Calculate current through 2 ohm. [8]



   b) Find the current I as shown in figure using star – delta transformation. [8]

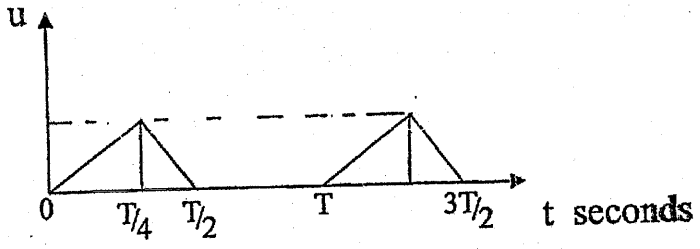


3. a) Calculate the current in the 10Ω resistor in the networks shown in the circuit using Thevenin's Theorem. [8]



b) Explain what is mean by self inductance and mutual inductance of a coil. [4]

c) Calculate the average and rms value of the waveform shown below, over one cycle. [4]



4. a) State and explain reciprocity theorem with a suitable example. [4]

b) A resistance of 20Ω, an inductance of 0.2 H and a capacitance of 100 μF are connected in series across a 220 V, 50 Hz supply. Determine the following (i) impedance (ii) current (iii) voltage across R, L and C. [4]

c) Two impedances z_1 and z_2 are connected in parallel. The first branch takes a leading current of 16A and has a resistance of 5Ω, while the second branch takes a lagging current at power factor 0.8. The total power supplied is 5 kW, the applied voltage being (100+j200) V. Determine the branch and total currents. [8]

5. a) What are the disadvantages of supplying a low power factor? A 100 KW load at 0.85 lagging power factor is being supplied by a 230 V, 50 Hz source. Calculate the reactive power drawn from the source. If a capacitor connected parallel to the load improves its power factor to 0.9, find the capacitance of the capacitor. Also, calculate the current drawn from the source before and after connecting the capacitor. [2+6]

b) A three phase delta connected system with 400V line voltage is connected to three unbalanced loads: (12-j16)Ω, (3+j4), and 20Ω, are also connected in delta. Find (i) phase currents (ii) line currents (iii) total active power consumed. [8]

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15 TRIBHUVAN UNIVERSITY
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2074 Chaitra

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Level	BE	Full Marks	80
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Subject: - Basic Electrical Engineering *(EE401)*

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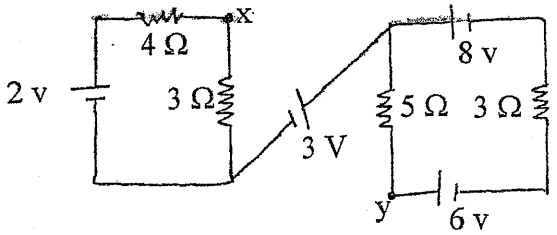
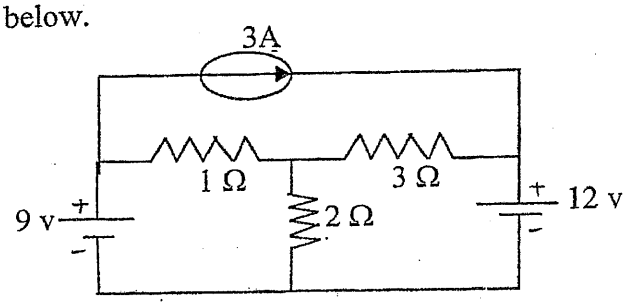
1. a) What is source transformation? Explain with the help of an example. [4]

   b) A coil of stranded copper wire having a resistance of 12Ω at 25°C is embedded in the core of a large transformer supplied at 230 V. After the transformer has been in service for several hours, the resistance of the coil is found to be 13.4 Ω. What is the temperature of the core? Also find the power rating of the resistance. Assume temperature coefficient of wire as 0.00125/°C at 15°C. [6]

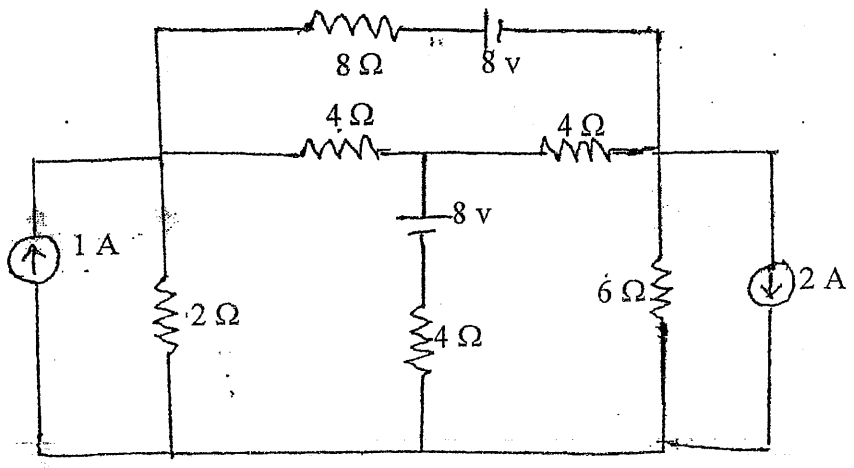
   c) Find V_{xy} in the following circuit diagram. [6]



2. a) Use loop current method to calculate the current through the 2Ω resistance for the network shown below. [6]



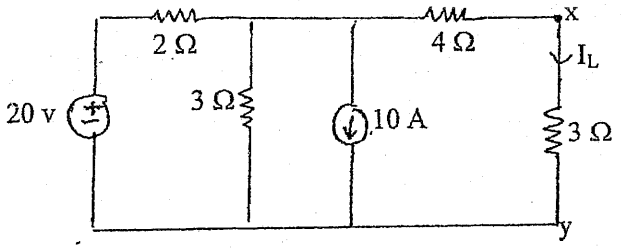
   b) Solve the given network with nodal analysis to find voltage drop on 8Ω resistor. [6]



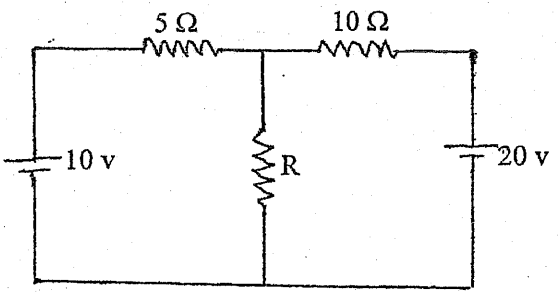
   c) State and explain Norton's theorem with suitable example. [4]

P.T.O.

3. a) Find power dissipated in 3 Ω resistor using Norton's theorem. [6]

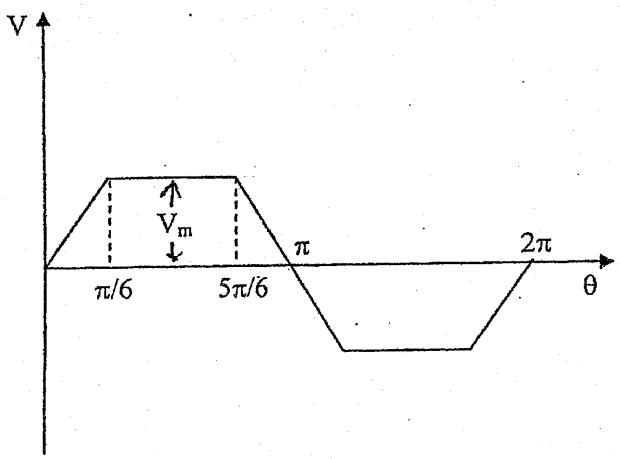


b) Calculate the value of 'R' such that maximum power will be absorbed by it in the given circuit. [6]



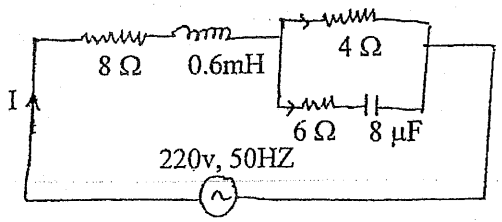
c) What is inductance? Derive the expression for two inductances in series, with mutual flux aiding each other. [4]

4. a) Calculate the average (half period) value and rms value of the waveform shown below. [4]



b) An alternating source of emf v =200sin (314t) volts is applied to a practical coil with resistance 20Ω and inductance 0.1 H respectively. Determine (i) expression for instantaneous current and power factor (ii) active reactive and apparent power of circuit (iii) voltage drop on resistor and inductor and (iv) construct phasor diagram for above circuit. [6]

c) Find current flowing in each branches of the following circuit: [6]



5. a) A 400V, 50 H3, 3 phase induction motor takes 60 KW power from supply mains at 0.8 power factor lagging. Calculate the capacitance per phase and KVAR rating per phase of capacitor in order to improve the power factor to 0.9 lagging using (i) star connected capacitor bank and (ii) Delta connected capacitor bank. [8]

b) Define phase order and explain its significance. A three phase balanced star connected load with (6+j8) ohm per phase is supplied by 400V, 50 HZ three phase source. Find the line and phase currents and the total power dissipated in the load. [2+6]

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25, TRIBHUVAN UNIVERSITY
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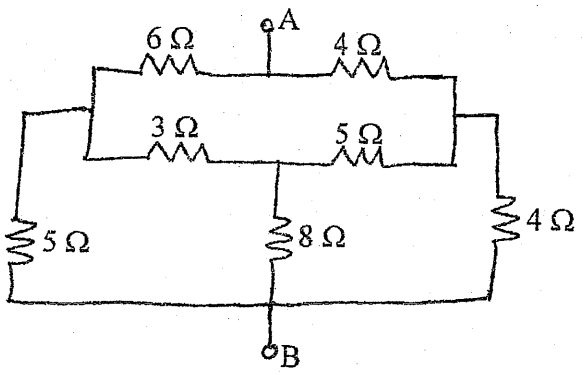
1. a) What do you mean by ideal and practical voltage and current source? Explain the method for converting practical voltage source into current source and vice versa. [5]

   b) A 60 watt, 240 V incandescent filament lamp is switched on at 20°C. The operating temperature of the filament is 2000°C. Determine the current taken by the lamp at the instant of switching ON. The temperature coefficient of resistance of the filament material is 0.0045°/k. [6]

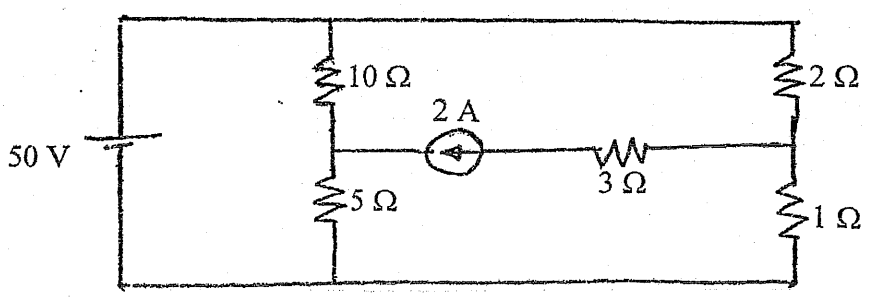
   c) A circuit containing three resistors with resistances 12Ω, 18Ω and 36Ω respectively joined in parallel is connected in series with a fourth resistance. The whole circuit is supplied at 60V and it is found that power dissipated is 12Ω resistance is 36watt. Determine the value of fourth resistance and the total power dissipated in the group. [5]

2. a) Make comparison table between series and parallel circuit. [4]

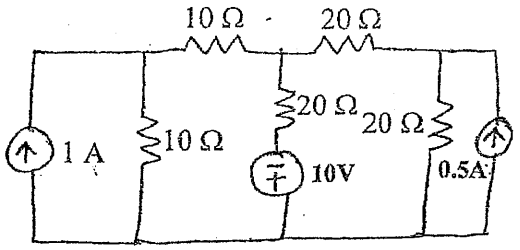
   b) For the circuit shown in below figure, determine the resistance between points A and B using star / delta transformation theorem. [6]



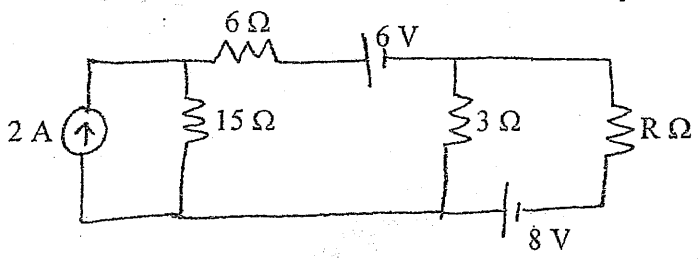
   c) Find all branch currents in the given circuit by using mesh current method. [6]



3. a) Using Nodal analysis, determine currents in each branch of the network shown in below figure. Also find the total power loss in the network. [8]



b) Find the value of Resistance 'R' to have maximum power transfer in the circuit as shown in below figure. Also obtain the amount of maximum power. [8]



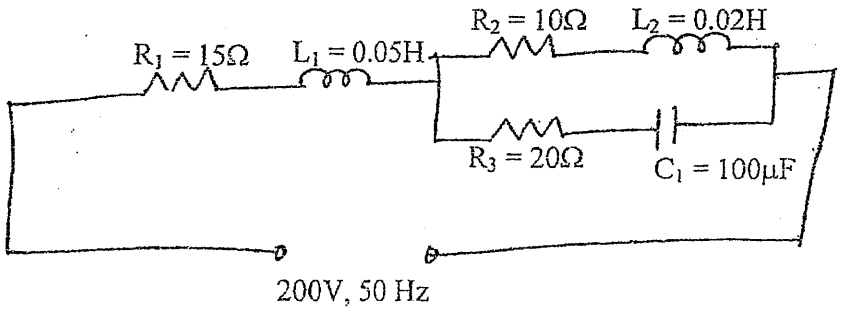
4. a) Two inductances L_1 and L_2 are connected in parallel. Derive the relation showing the equivalent inductance of the combination when mutual flux helps the individual flux. what will be the equivalent inductance of the combination when mutual flux opposes the individual flux? [4]

b) Two alternating currents represented by the equations $i_1 = 7\sin\omega t$ and $i_2 = 10\sin\left(\omega t + \frac{\pi}{2}\right)$ are fed into a common conductor. Find the equation for the resultant current and its RMS value. [4]

c) Below Figure shows a series parallel circuit. Find: [8]

(i) total impedance
(ii) current drawn from the circuit
(iii)voltage across the parallel branches
(iv)current flowing through each parallel branch
(v) power factor
(vi)Active, reactive and apparent power

Also, draw the phasor diagram of the circuit.



200V, 50 Hz

5. a) A fluorescent lamp takes a current of 0.75A when connected across a 240V, 50Hz a.c supply. The power consumed by the lamp is 80 watt. Calculate the value of the capacitance to be connected in parallel with the lamp to improve the power factor to (i) unity (ii) 0.95 lagging. [6]

b) The following balanced three phase loads are connected to a 415 V, three phase, four wire supply. [4]

(i) 160 kVA at 0.7 power factor lagging
(ii) 50 kVA at 0.65 power factor leading
(iii)50 kW at unity power factor

Calculate (a) the total load in kVA (b) the line current (c) the combined power factor

c) Prove that sum of the readings of two wattmeters is equal to the total three phase power in measurement of power of 3-phase circuit by 2 wattmeter method. [6]

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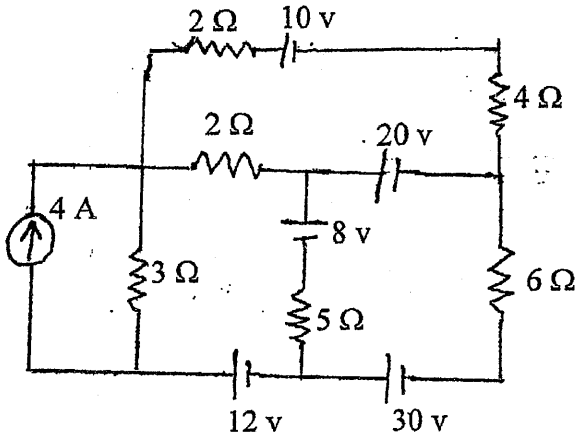
1. a) Differentiate between Practical Voltage Source and Practical Current Source. [4]

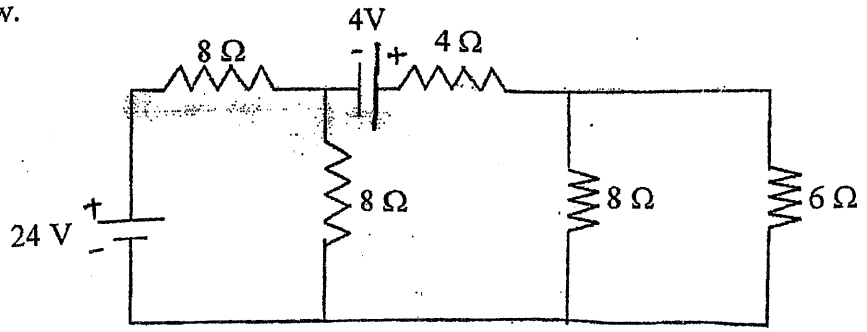
   b) The field winding of dc motor takes 1.15 A current at 20°C. If current falls to 0.26 A after working for some hours, supply voltage remaining constant, find the final working temperature of field winding. Given, $\alpha_0 = \frac{1}{234.5}$ and voltage = 230V. [6]

   c) Three lapms of rating 220 V and 150 watt, 200 watt and 450 watt are connected across 200 V supply. Calculate the resistance of each lamp and the power consumed by each lamp at 200 V. [6]

2. a) Solve the given network with mesh analysis to find voltage drop on 5 Ω resistors. [6]

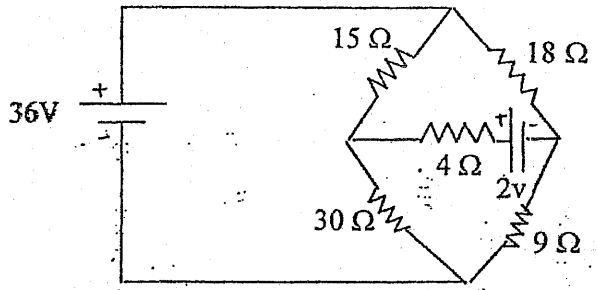


   b) Use nodal analysis to find the current through 4Ω resistor for the network shown below. [6]

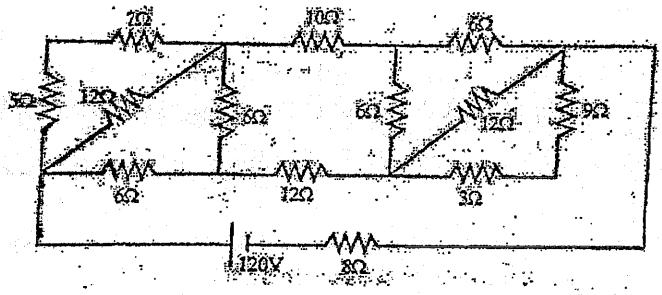


   c) State and explain superposition theorem with suitable example. [4]

3. a) Using thevenin's theorem find the current through the 4Ω for the network shown below. [6]

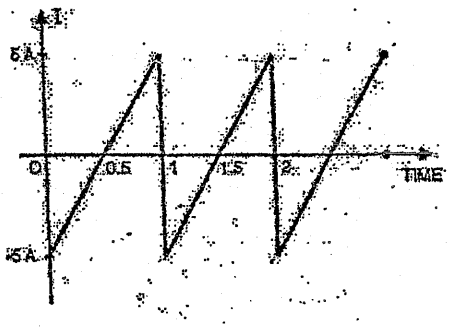


b). Determine the power dissipated in the 8Ω resistor of the given network using star-delta and delta-star transformation. [6]



c) How mutual inductance between two coils depends upon dimensions of core and coils. [4]

4. a) Find the form factor and peak factor of the current waveform given below. [4]



b) A coil of inductance 318.3 mH is connected in series with a 200Ω resistor to a 240 V, 50 Hz supply. Calculate the current flowing, power factor, active and reactive power of the circuit. Also draw the phasor diagram. [6]

c) $Z_1 = (40 - j318.31)$ and $Z_2 = (50 + j62.83)$ are connected in parallel to each other and a source of 100v, 50 Hz is applied across the overall circuit. Calculate (i) circuit current (ii) Active, reactive and apparent power. [6]

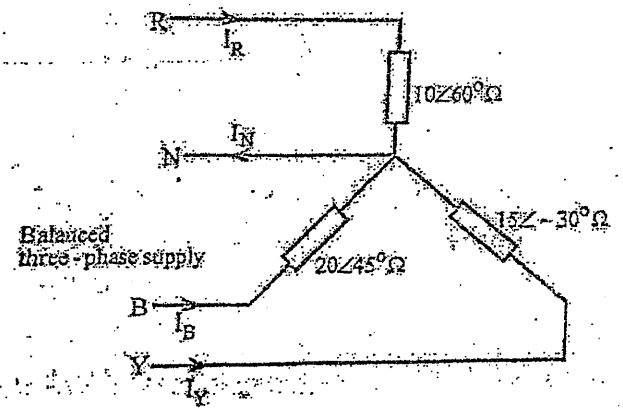
5. a) Discuss the effect of low power factor. A single phase load of 7Kw operates at a power factor 0.7 lagging. It is proposed to improve the power factor to 0.9 lagging by connecting a capacitor the load. Calculate the KVAr rating of the capacitor. [3+5]

b) For the following unbalanced system with balanced three phase supply of 400 V, 50 Hz, calculate: [8]

i) The line currents and neutral current

ii) Active and reactive power abosrbed by the circuit

iii) Draw the phasor diagram.



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25, TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BAME, BCT, BIE, B.Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE401)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

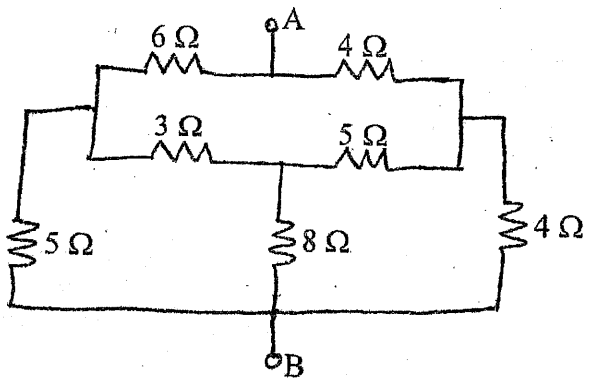
1. a) What do you mean by ideal and practical voltage and current source? Explain the method for converting practical voltage source into current source and vice-versa. [5]

   b) A 60 watt, 240 V incandescent filament lamp is switched on at 20°C. The operating temperature of the filament is 2000°C. Determine the current taken by the lamp at the instant of switching ON. The temperature coefficient of resistance of the filament material is 0.0045°/k. [6]

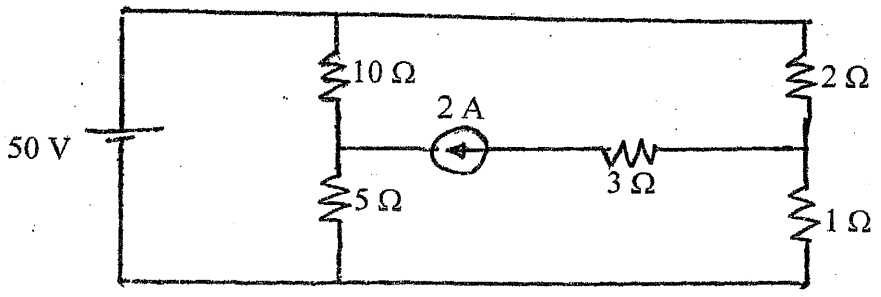
   c) A circuit containing three resistors with resistances 12Ω, 18Ω and 36Ω respectively joined in parallel is connected in series with a fourth resistance. The whole circuit is supplied at 60V and it is found that power dissipated is 12Ω resistance is 36watt. Determine the value of fourth resistance and the total power dissipated in the group. [5]

2. a) Make comparison table between series and parallel circuit. [4]

   b) For the circuit shown in below figure, determine the resistance between points A and B using star / delta transformation theorem. [6]



   c) Find all branch currents in the given circuit by using mesh current method. [6]



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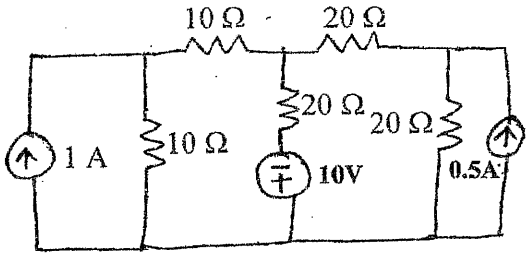
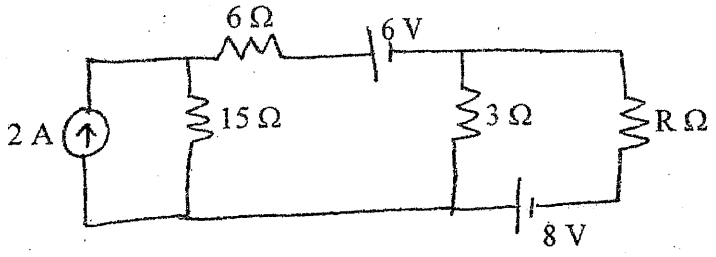
3. a) Using Nodal analysis, determine currents in each branch of the network shown in below figure. Also find the total power loss in the network. [8]



b) Find the value of Resistance 'R' to have maximum power transfer in the circuit as shown in below figure. Also obtain the amount of maximum power. [8]



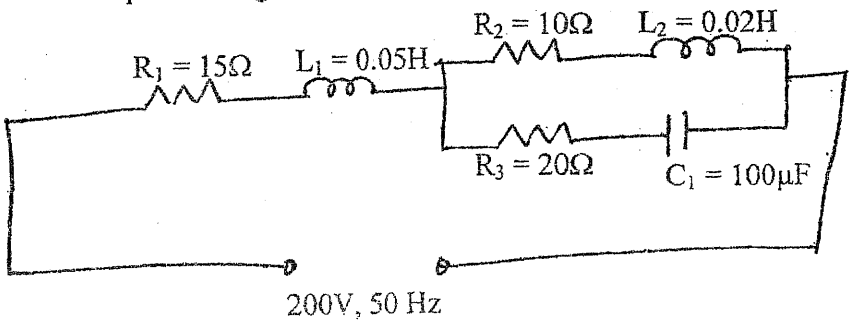
4. a) Two inductances L_1 and L_2 are connected in parallel. Derive the relation showing the equivalent inductance of the combination when mutual flux helps the individual flux. what will be the equivalent inductance of the combination when mutual flux opposes the individual flux? [4]

b) Two alternating currents represented by the equations $i_1 = 7\sin wt$ and $i_2 = 10\sin\left(\omega t + \frac{\pi}{2}\right)$ are fed into a common conductor. Find the equation for the resultant current and its RMS value. [4]

c) Below Figure shows a series parallel circuit. Find: [8]

(i) total impedance
(ii) current drawn from the circuit
(iii)voltage across the parallel branches
(iv)current flowing through each parallel branch
(v) power factor
(vi)Active, reactive and apparent power

Also, draw the phasor diagram of the circuit.



5. a) A fluorescent lamp takes a current of 0.75A when connected across a 240V, 50Hz a.c supply. The power consumed by the lamp is 80 watt. Calculate the value of the capacitance to be connected in parallel with the lamp to improve the power factor to (i) unity (ii) 0.95 lagging. [6]

b) The following balanced three phase loads are connected to a 415 V, three phase, four wire supply. [4]

(i) 160 kVA at 0.7 power factor lagging
(ii) 50 kVA at 0.65 power factor leading
(iii)50 kW at unity power factor

Calculate (a) the total load in kVA (b) the line current (c) the combined power factor

c) Prove that sum of the readings of two wattmeters is equal to the total three phase power in measurement of power of 3-phase circuit by 2 wattmeter method. [6]

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BAME, BCT, BIE, B.Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE401)*

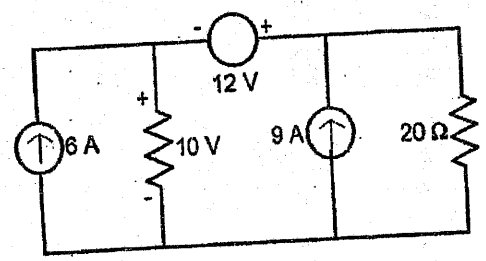
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Describe the open circuit, close circuit and short circuit with diagram. [4]

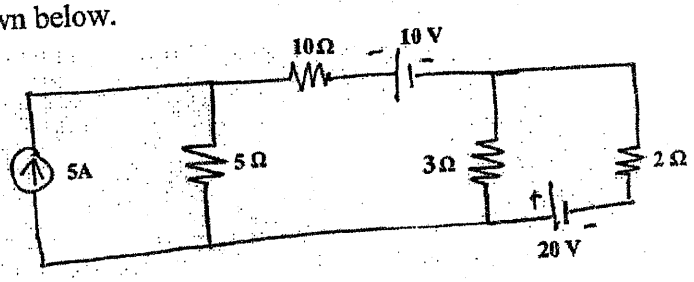
   b) Two conductors, one of copper and the other of iron are connected in parallel and at 20°C carry equal currents. What proportion of current will pass through each, if the temperature is raised to 100 °C? Assume temperature coefficient of resistance at 20 °C for copper as 0.0042 per °C and for iron as 0.006 per °C. [6]

   c) A direct current circuit comprises two resistors A of value 25Ω and B of unknown value, connected in parallel together with a third resistor C of value 5Ω connected in series with the parallel group. The potential difference across C is found to 90V. If the total power in the circuit is 4320 watt. Calculate (i) the value of resistor B, (ii) the voltage applied to the ends of the whole circuit, (iii) the current in each resistor. [6]

2. a) Using mesh analysis, calculate the voltage across the 20 Ω resistor shown in the figure below. [6]

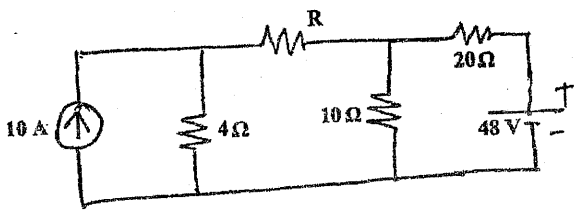


   b) Use the nodal voltage method to find the current flowing through 10Ω resistor for the network shown below. [6]

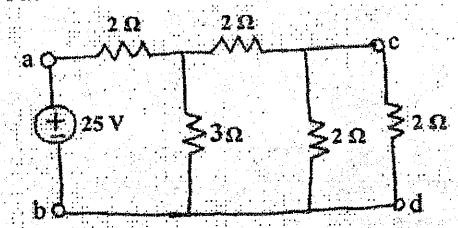


   c) State and explain thevenin's theorem with suitable example. [4]

3. a) What is the value of R such that maximum power is transferred to it? Find the value of this maximum power for the circuit shown below. [6]

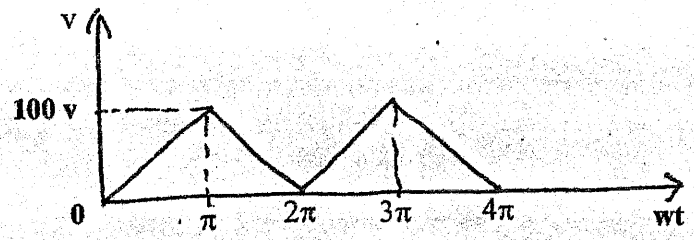


b) State reciprocity theorem. Verify the reciprocity theorem for the network shown in figure below in branch cd. [6]



c) Define capacitance and derive relation for connection of capacitors in series. [4]

4. a) Calculate the form factor and peak factor of the following triangular waveform. [4]



b) A choke coil having a resistance of 10Ω and inductance of 0.05H is connected in series with a condenser of 100 μF. The whole circuit has been connected to 200V, 50 Hz supply. Calculate (i) impedance (ii) current (iii) power factor (iv) power input (v) Apparent and reactive power of circuit. [6]

c) A 10 ohm resistor, a 31.8 mH inductor and 318μF capacitor are connected in parallel and supplied from a 200V, 50Hz supply source. Calculate the supply current and power factor and also calculate current in each branch. [6]

5. a) Define power factor and explain the disadvantages and causes of low power factor? [4]

b) A balanced star-connected load of $(8+\hat{j}6)\,\Omega$ per phase is connected to a balanced 3 phase 400V, 50Hz supply. Find the line current, phase current and total power consumed. Take RYB phase sequence. [6]

c) With the help of connection and phasor diagrams, show that the power of a balanced three phase load can be determined using two-wattmeters. [6]

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2072 Chaitra

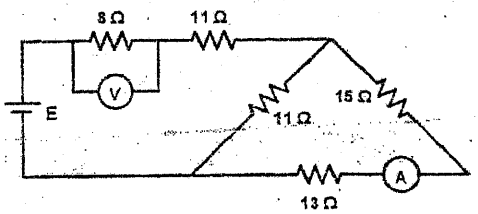
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAME, BIE, B.Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE401)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

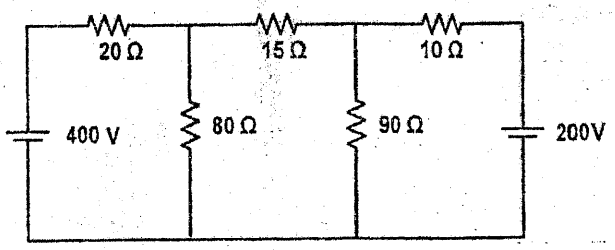
1. a) A 60 W, 240 V incandescent filament lamp is switched on at 20°C. The operating temperature of the filament is 2000°C. Determine the current taken by the lamp at the instant of switching ON. the temperature coefficient of resistance of the filament material is 0.0045/K. [6]

   b) A battery of unknown emf is connected across resistances, as shown in figure below. The voltage drops across the 8 Ω resistor is 20 V. What will be the current reading in the ammeter? What is the emf of the battery? [5]

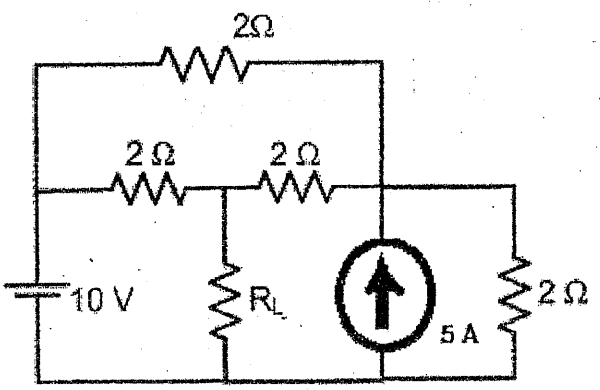


   c) What do you mean by ideal and practical voltage and current sources? [5]

2. a) Find the power dissipation in 15 Ω resistor shown in figure below using mesh analysis. [6]

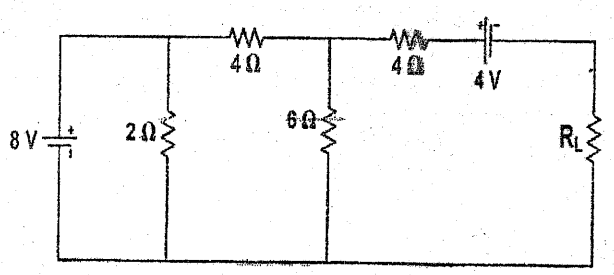


   b) Find current on load resistor R_L, if its resistance is 2 Ω, using superposition theorem. [6]



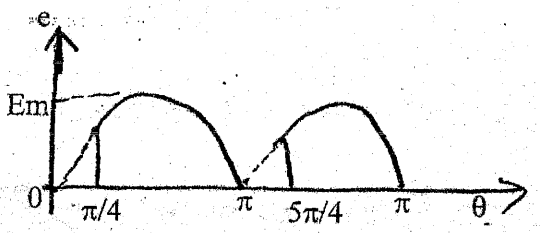
   c) State and explain Norton's theorem with an appropriate example. [4]

3. a) Find the value of R_L for which the maximum power is transferred in the load resistance R_L. Also find the maximum power that can be transferred to the load resistance R_L. [8]



b) Derive the expression for the inductance of inductor in terms of its physical dimensions. [4]

c) Calculate the average and rms value of full-wave rectified sine wave as shown below. [4]

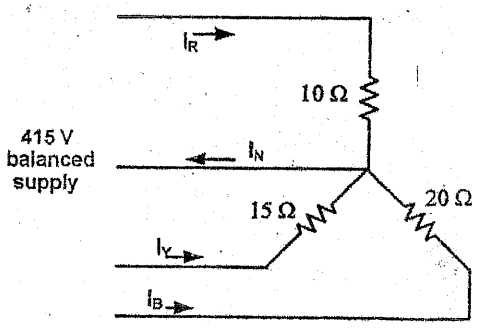


4. a) A circuit consisting of a resistance of 30 Ω in series with an inductance of 75 mH is connected in parallel with a circuit consisting of a resistance of 20 Ω in series with a capacitance of 100 μF. If the parallel combination is connected to a 240 V, 50 Hz single phase supply, calculate (i) The current in each branch (ii) The total current and power factor and (iii) Power consumed. Also draw a neat phasor diagram. [8]

b) For a series path with a resistance of 8 Ω, capacitor of 120μF and an inductance of 0.1 H, a capacitor 180μF is kept in parallel. Then the combination is fed by 240V, 50Hz, 1-ϕ supply. Calculate branch currents, total current from supply, power factor of whole circuit, active power and reactive power consumed by the circuit. Also show phasor diagram. [8]

5. a) Develop relation between phase voltage and line voltage in 3-ϕ star connected system. [4]

b) For the circuit shown in figure below, calculate the current through the neutral and the total power consumed in the load. [8]



c) Explain with connection diagram the measurement of 3-ϕ power using two wattmeters. [4]

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2073 Shrawan

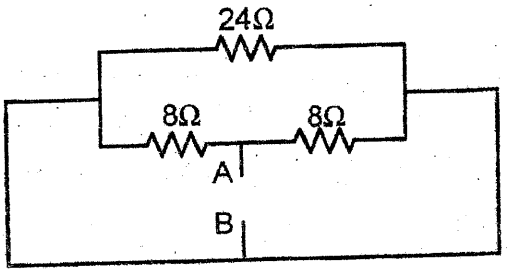
Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAME, BIE, B. Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE401)*

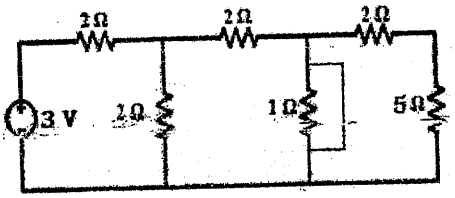
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) A coil has a resistance of 100 ohms, when the temperature is 20°C and 110 ohms when the temperature is 45° C. Find temperature rise when its resistance is 124 ohms, and surrounding temperature is 15° C. [6]

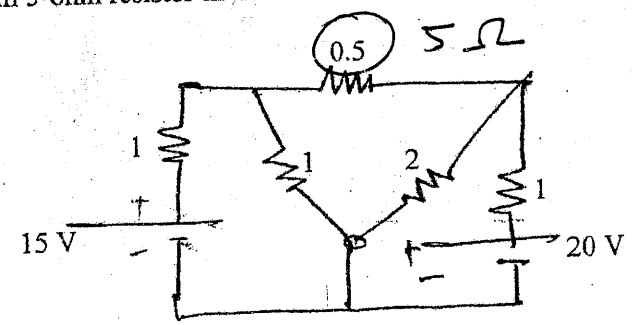
   b) Find the equivalent resistance between A and B for the network shown in figure below. [4]



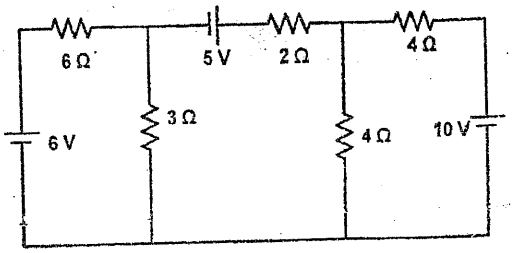
   c) Find current from the source in the following circuit diagram. [6]



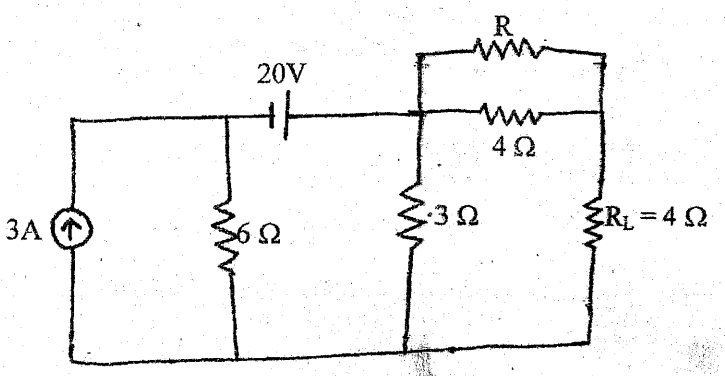
2. a) Find the current in 5-ohm resistor in the network shown below by using superposition theorem. [8]



   b) Find the branch currents in the circuit of figure below by using nodal analysis. [8]

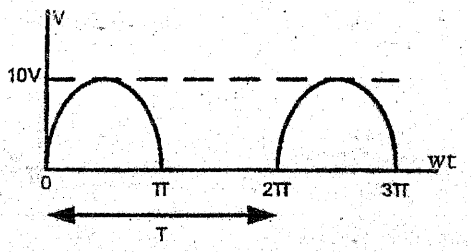


3. a) Find the value of Resistance 'R' such that the load resistance 'R_L' which is equal to 4 Ω, will deliver maximum power. Also find that maximum power. [8]

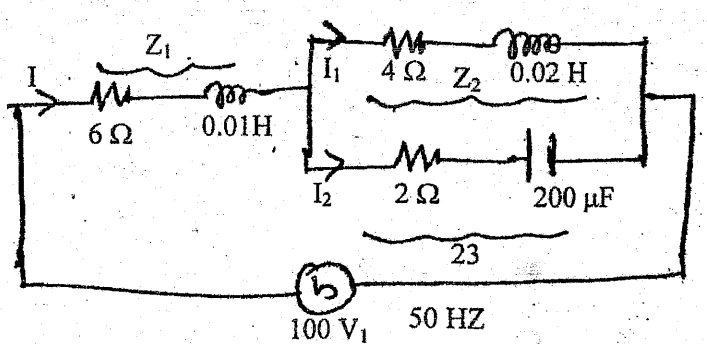


b) Derive an equation for inductance L in terms of flux linkages and current change. [4]

c) Calculate the (i) average value and (ii) RMS value of voltage wave shown in figure below: [4]



4. a) Determine the value of current I_1, I_2 and I and overall factor of the circuit shown in figure below for series and parallel circuit. Also draw the phasor diagram and find the total power consumed by the circuit. [8]



b) A coil is connected in series with a non-inductive resistance of 30Ω across 240V, 50Hz, 1-ϕ supply. The reading of voltmeters across the coil is 180 V and across the resistance is 130 V. Calculate, [8]

i) Inductance of coil
ii) Resistance of coil
iii) Power absorbed by coil
iv) Power absorbed by whole circuit

5. a) Define power factor and explain why in general it should be kept on high as possible in power supply system. [8]

b) Three similar coils each of resistance 7Ω and inductance of 0.03 H are connected in Delta to a 400 V, 3 phase, 50 Hz supply. Calculate the line current and the total power consumed. [8]

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE, B.Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE401)*

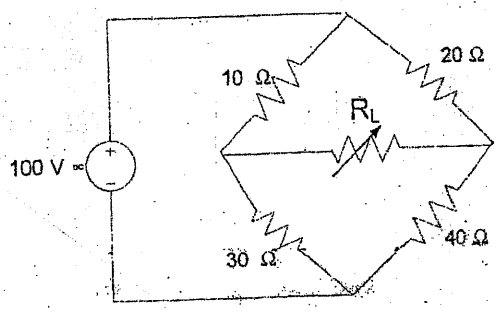
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Discuss voltage and current sources in brief. Also justify the statement "Terminal voltage goes on decreasing on increasing load current." [6]

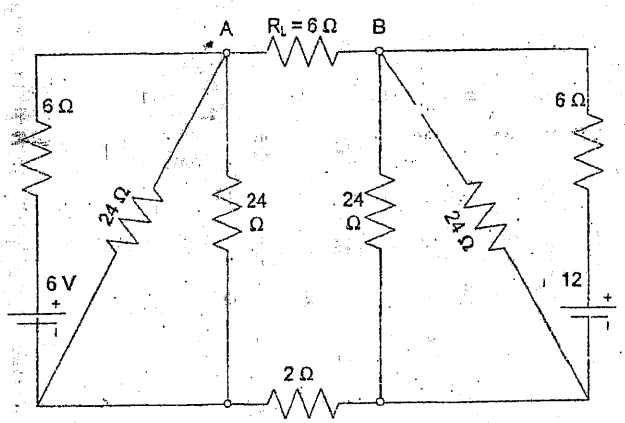
   b) The field winding of d.c. motor connected across 230 V supply takes 1.15 A at room temperature of 20°C. After working for some hours the current falls to 0.26 A, the supply voltage remaining constant. Calculate the final working temperature of field winding. Resistance temperature coefficient of copper at 20°C is 1/254.5. [6]

   c) Discuss roles of Kirchoff's laws in electrical circuit analysis with justification. [4]

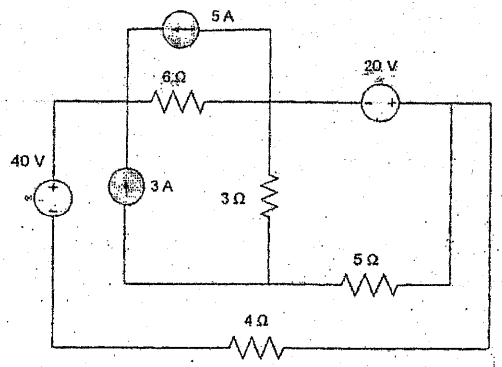
2. a) Determine the value of load resistance R_L to receive maximum power from the source. Also find the maximum power delivered to the load in the circuit shown in figure below: [8]



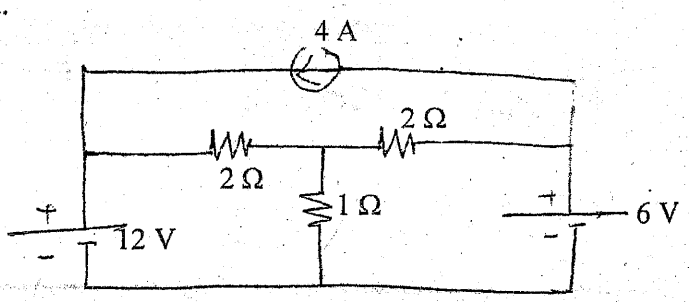
   b) Use the superposition theorem to determine the current in the branch 'AB' of the network shown below: [8]



3. a) Apply nodal analysis to calculate power dissipated by 5Ω resistor in the circuit shown in figure below: [8]

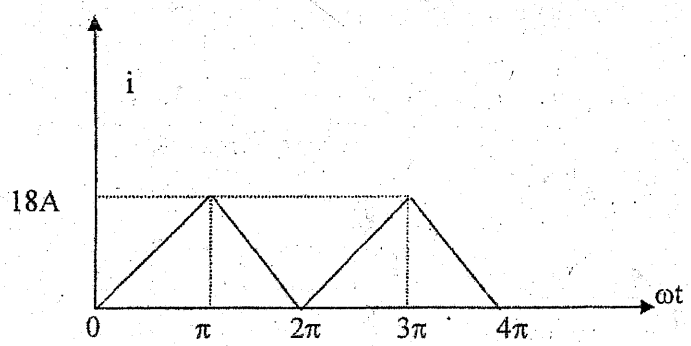


b) Calculate the current flowing through 1 ohm resistor for network shown below using loop current method. [8]



4. a) Derive the equation for instantaneous current flowing through a pure capacitor when excited by AC sinusoidal voltage $V = V_m \sin\omega t$. Draw the waveform of voltage and current and phasor diagram of the circuit. Show analytically and graphically that it does not consume real power. [6]

b) Calculate the rms value of current of the following triangular waveform. [6]



c) Derive an expression for the equivalent capacitance of a group of capacitors when they are connected in series. [4]

5. a) A series R-L-C circuit having R = 100 Ω, L = 0.12 H and c = 28.27 μF is fed from a 100 V, 50 Hz supply. Find the current flowing active power, reactive power, power factor, rms values of voltage across each elements. Also draw phasor diagram. [6]

b) Each phase of a 3-phase, delta-connected load consists of an impedance $Z = 20 \angle 60°$ ohm. The line voltage is 440 V at 50 Hz. Compute the power consumed by each phase impedance and the total power. What will be the readings of the two wattmeters connected? [6]

c) Derive the expression for inductance of a coil in terms of its dimensions. [4]

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE, B.Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE401)*

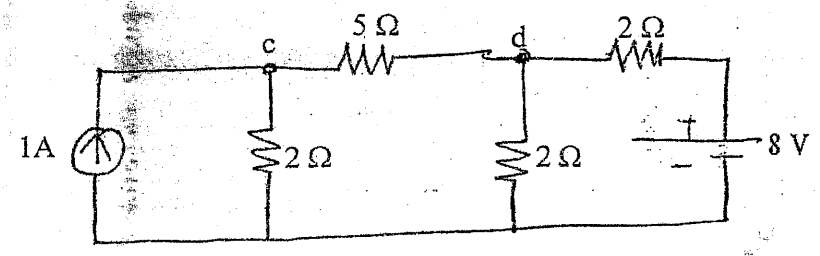
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Explain ideal current and voltage sources. [4]

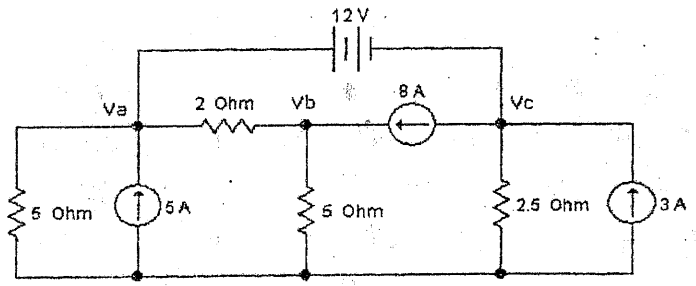
   b) Define temperature coefficient of resistance. The resistance of a certain length of wire is 4.6Ω at 20°C and 5.88Ω at 80°C. Determine (a) The temperature coefficient of resistance of the wire at 0° (b) The resistance of the wire at 60°C. [8]

   c) State and explain Superposition theorem with an appropriate example. [4]

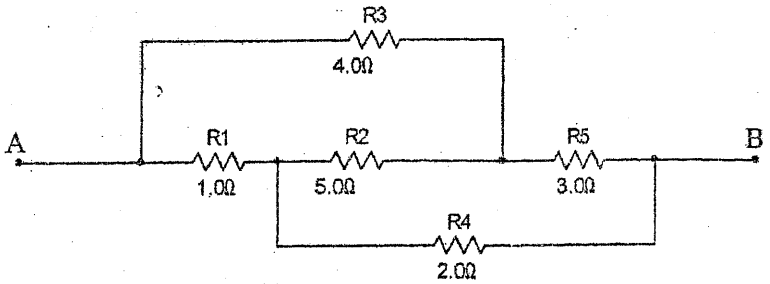
2. a) Find out the current through 5 ohm resistor connected across the terminal c and d in the network shown below using the Venin's theorem. [8]



   b) Use Nodal Analysis Method to determine the V_a, V_b and V_c and calculate current through 2.5 Ω. [8]



3. a) Find the resistance between the terminals A and B in the circuit segment below. [4]



b) Three capacitors A, B and C have capacitances 10, 50 and 25 μF respectively. Calculate: [6]

i) Charge on each when connected in parallel to a 250 V supply

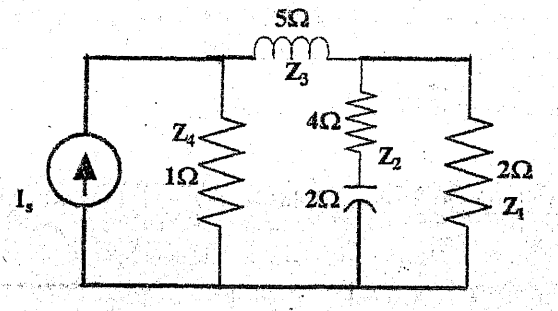
ii) Total capacitance and

iii) p.d. across each when connected in series

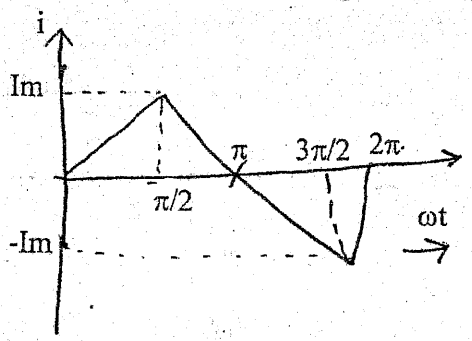
c) State Maximum Power Transfer Theorem and also prove "maximum power will be dissipated when $R_{Internal} = R_L$" [6]

4. a) Derive the expression for electrical current in a pure inductive circuit when input power is $V_m Sinwt$. Draw the wave form of voltage and current and phasor diagram of the circuit. Show analytically and graphically that it does not consume real power. [6]

b) In the given circuit, find the current through the inductor, what is the equivalent impedance? [6]



c) Find the peak factor and form factor of the triangular wave shown in figure below. [4]



5. a) Explain the importance of power factor in an ac circuit, with suitable example. How power factor can be improved? [4]

b) A three phase star connected system with line voltage 400 V is connected to three loads: $25\angle 0°$, $11\angle -20°$ and $15\angle 10°$ (also connected in star). Find the line to line current, total power and current in the neutral of the system. [8]

c) Define phase sequence and explain its significance in three phase system. [4]

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE, B. Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE401)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

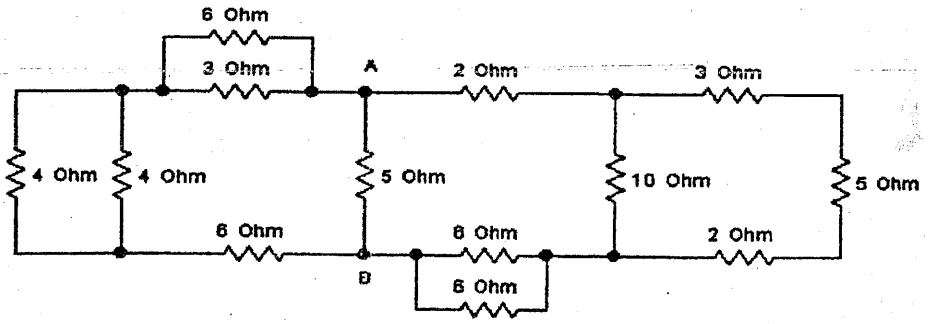
1. a) What is the factor responsible for the deviation of the practical sources from their ideal behavior? Explain the effect of this factor on the terminal characteristics of the voltage source. [6]

   b) Write down the steps to calculate Norton's equivalent resistance in the circuit with a suitable example. [4]

   c) A conductor material has a free electron density of 10^{24} electrons per m^3. When a voltage is applied a constant drift velocity of 1.5×10^{-2} m/s is attained by the electrons. If the cross sectional area of the material is 1 cm^2, calculate the magnitude of the current. [6]

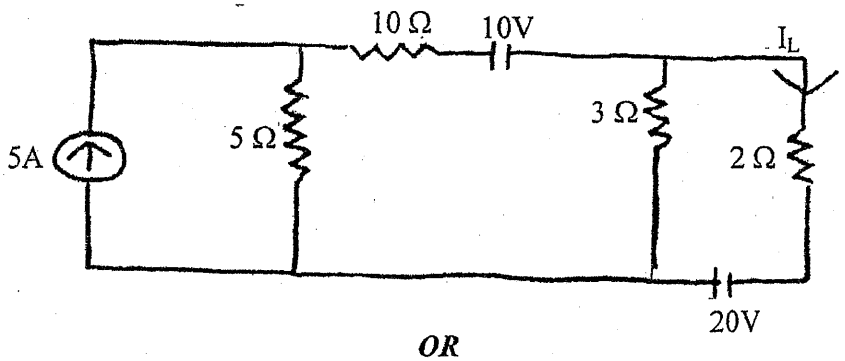
2. a) Explain with neat diagram and write the equations for Delta- Star Conversion and for Star-Delta Conversion. [4]

   b) Find the equivalent resistance across the terminals A and B, R_{AB}. [6]



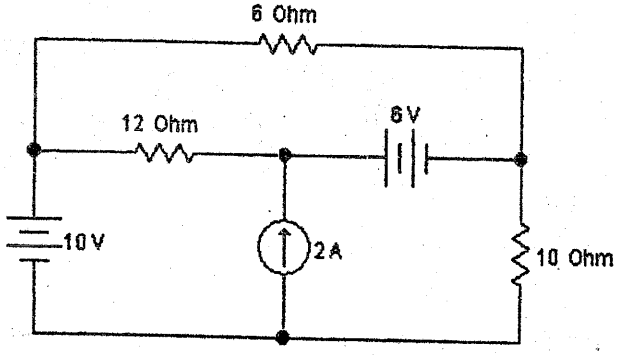
   c) "Thevenin's theorem and Norton's theorem are dual of each other". Justify the statement with suitable example. [6]

3. a) Use Superposition theorem to find the current I_L through 2 Ω resistors in figure below. [8]



OR

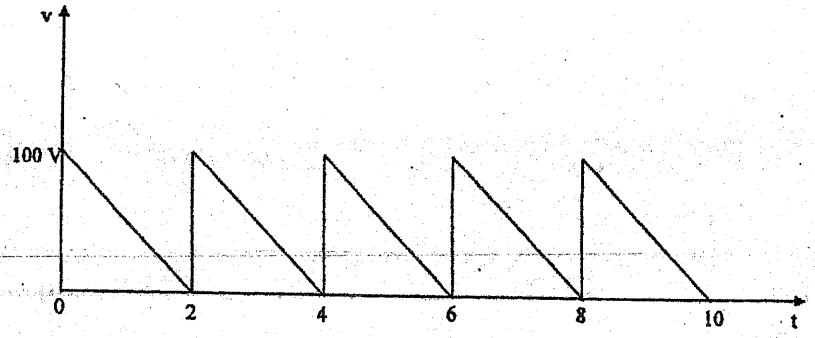
Find the current passing through 10 Ω resistor using loop current method.



b) Calculate the inductance that must be connected in parallel with a 100 MH inductor to give a total inductance of 70 mH. Assume no mutual inductance between the two. [4]

c) Two impedances (3-4j) and (8+6j) are connected in parallel across an ac voltage source. If the total current drawn from the source in 25 A, find the total active power consumed by the impedances. [4]

4. a) Find the average value, rms value of the voltage waveform given below. [8]



b) An Industrial load consists of the following: [8]

i) A load of 200 KVA @ 0.8 power factor lagging
ii) A load of 50 KW @ unity power factor
iii) A load of 48 KW @ 0.6 power factor leading
Calculate the total KW, Total KVAR, Total KVA and the overall power factor.

5. a) A 100 KW load at 0.8 lagging power factor is being supplied by a 220 V, 50 Hz source. Calculate the reactive power drawn from the source. If a capacitor connected parallel to the load improves its power factor to 0.9. Find the capacitance of the capacitor. Also calculate the current drawn from the source before and after connecting the capacitor. [8]

b) With the help of necessary Phasor diagram and circuit diagram, explain the two wattmeter method of Active Power Measurement in Three Phase AC system? What is the variation of wattmeter readings with load Power Factor? [8]

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL,BEX,BCT,BIE, B.Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

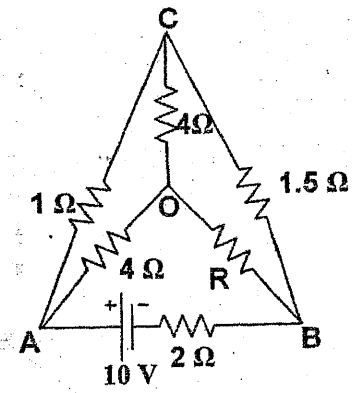
Subject: - Basic Electrical Engineering *(EE401)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

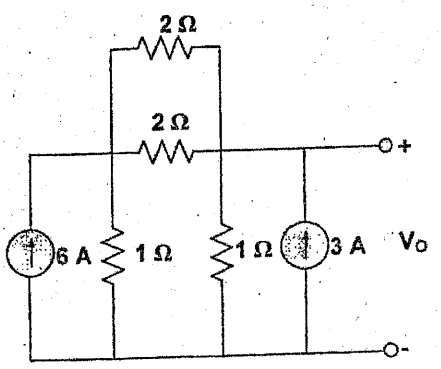
1. a) What do you understand by terms 'resistance' and 'resistivity'? On what factors the resistance offered by a conductor depends? [4]

   b) Two resistors made of different materials having temperature coefficients of resistance $\alpha_1 = 0.004/°C$ and $\alpha_2 = 0.005/C°$ are connected in parallel and consume equal power at 15°C. What is the rate of power consumed in resistance R_2 to that in R_1 at 70 c°? [6]

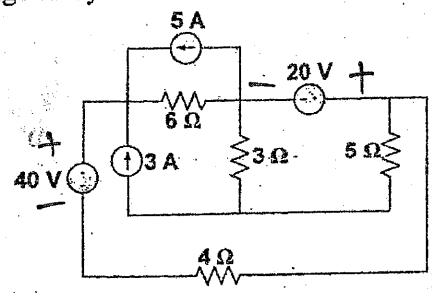
   c) Calculate the value of unknown resistance R, in the circuit shown below and the current flowing through it when the current in the branch OC is zero. [6]



2. a) Calculate the output voltage, V_o for the circuit shown in figure below using Kirchoff's laws. [5]

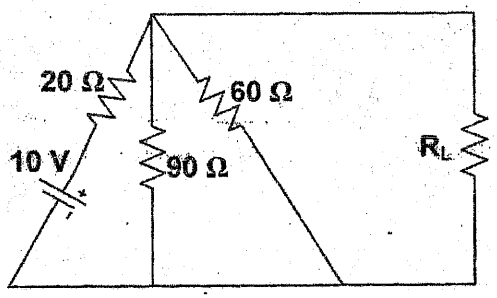


   b) Determine the power dissipated by 5Ω resistor in the circuit shown in figure below by applying nodal voltage analysis. [6]

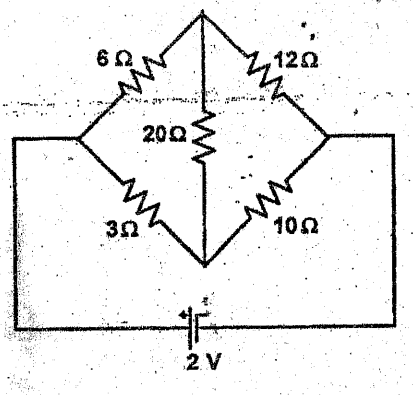


   c) State and explain superposition Theorem with an appropriate example. [5]

3. a) For the circuit shown in figure below, what will be the value of R_L to get the maximum power? What is the maximum power delivered to the load? [8]



b) Determine the current in 20Ω resistor of the network shown in figure below using Star Delta Transformation [4]



c) State the definition of the capacitance and from it write an equation for the charge stored in a capacitor. [4]

4. a) Derive the equation for instantaneous current flowing through a pure capacitor when excited by AC sinusoidal voltage $V = V_m \sin\omega t$. Draw the waveform of voltage and current and phasor diagram of the circuit. Show analytically and graphically that it does not consume real power. [4]

b) A coil takes 1.3 kVA nd 1.2 kVAR when connected to a 240 V, 50 Hz sinusoidal supply. Calculate: (i) Power dissipated (ii) Current and (c) Inductance of the coil. [4]

c) A Circuit consisting of a resistance of 30Ω in series with an inductance of 75mH is connected in parallel with a circuit consisting of a resistance of 20Ω in series with a capacitance of 100μF, if the parallel combination is connected to a 240V, 50Hz, single-phase supply. Calculate (i) The total current (ii) Power factor (iii) Active and reactive power. Also draw a neat phasor diagram. [8]

5. a) What are the two ways of connecting a 3-phase system? Draw their phasor diagrams and write down the relationship between phase and line voltages and phase and line current for these system. [4]

b) A 220 V, 3-phase voltage is applied to a balanced delta connected 3-phase load of phase impedance (15+j20)Ω. Calculate: [8]

i) The phase voltages
ii) The phasor current in each line
iii) The power consumed per phase
iv) Draw the phasor diagram
v) What is the phasor sum of three line currents? Why does it have this value?

c) Explain 2-wattmeter method for the measurement of power in a balanced three phase load. [4]

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

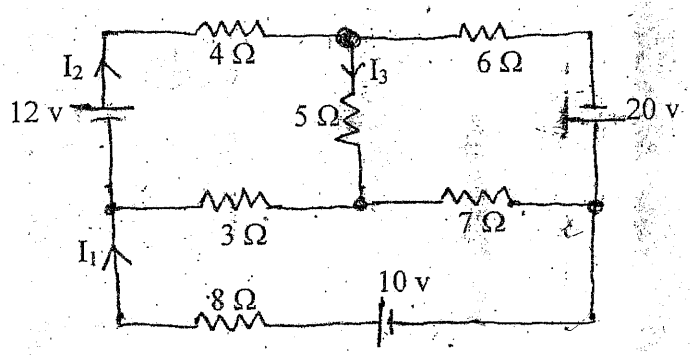
Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE, B.Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE401)*

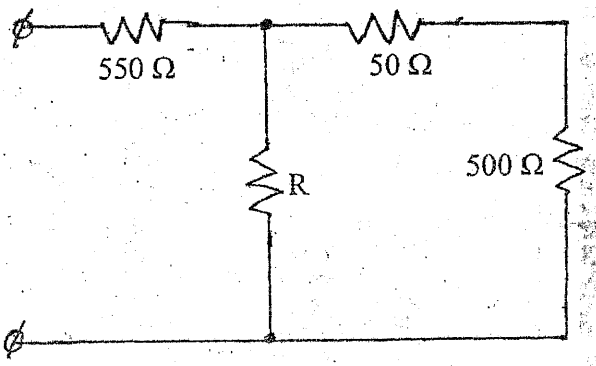
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Five** questions.*
- ✓ *All questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

1. a) What is the difference between the potential difference and electromotive force? [4]

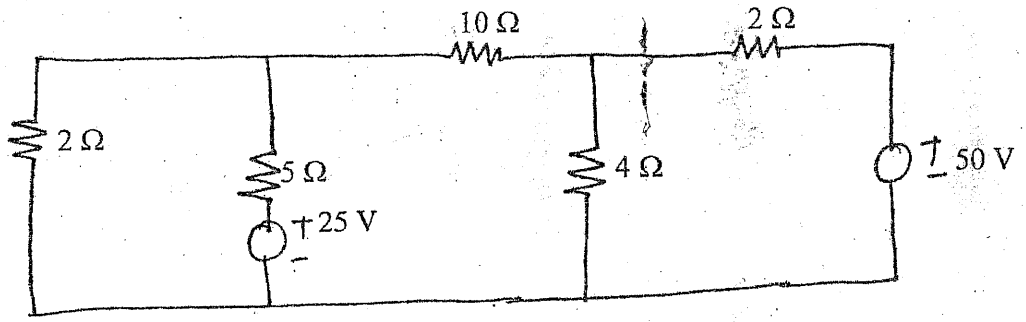
   b) Find I_1, I_2 and I_3 in the circuit shown in the figure using Kirchh-off's law. [6]



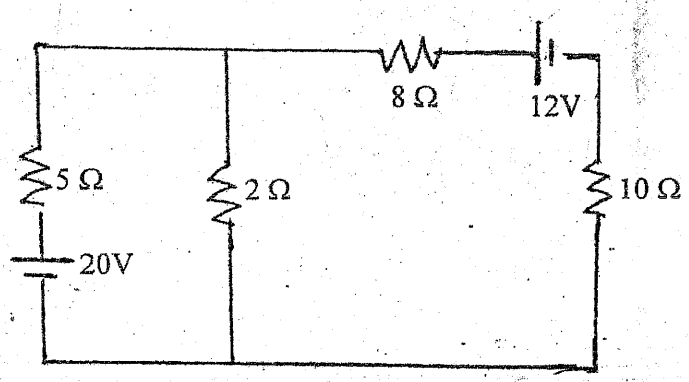
   c) What is the value of the unknown resistor 'R' in figure below, if the voltage drop across 500Ω resistor is 2.5 volts? [6]



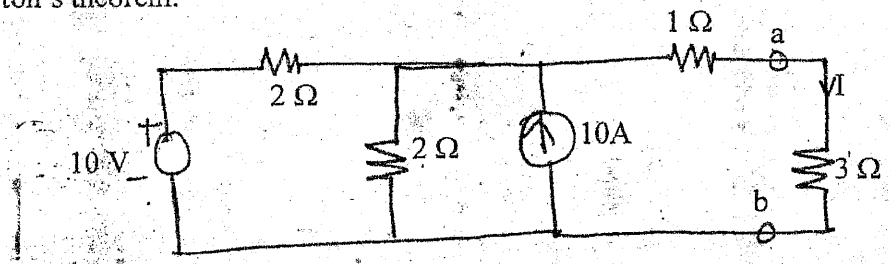
2. a) Use the node voltage method (nodal) to find the current flowing through 10Ω resistor in the network shown figure below. [8]



b) For the circuit shown in figure below, calculate the current in the 10 ohm resistance using Thevenin's theorem. [8]



3. a) Determine power dissipated in 3Ω resitor in the circuit shown in figure below using Norton's theorem. [8]



b) An inductor is to be made with copper wire wound on a circular iron core having mean length of 40 cm with cross-sectional area of 50 sq mm. If the required value of inductance is 500 mH, calculate the number of turns required given that relative permeability of the core is 1500. [8]

4. a) A 415 V, 3 phase, 50 HZ induction motor takes 50 KW power from supply mains at 0.72 power factor lagging. A bank of capacitors is connected in delta across the line to improve the overall power factor. Calculate the capacitance per phase in order to raise the power factor to 0.9 lagging. [8]

b) Three loads (31+j59) Ω, (30-j40)Ω and (80+j60)Ω are connected in delta to a 3 phase, 200 V supply. Find the phase currents, line currents and total power absabed. [8]

5. a) Define cycle, Time period, angular velocity, frequency, average and rms value of an alternating quality. [6]

b) A series circuit consists of resistance equal to 4Ω and inductance of 0.01 H. The applied voltage is 283 sin (300t + 90°)V. Calculate the following: [10]

i) Power factor
ii) Expression for i(t)
iii) The power dissiputed in the circuit
iv) Voltage drop across each elements
v) Draw a phasor diagram

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2069 Chaitra

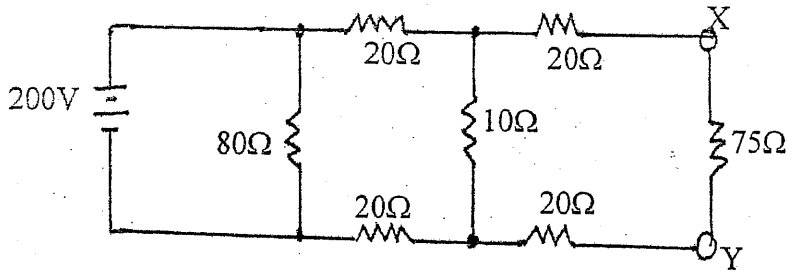
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE, B.Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE401)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Five** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Explain the methods for converting practical current source in to practical voltage source. [4]

   b) Calculate the power which would be dissipated in a 75 Ω resistor connected across XY in the network shown below. [4]



   c) Find the currents I_1, I_2, I_3 using Kirchhoff's Law and also find the power output of each voltage source of figure below? [8]

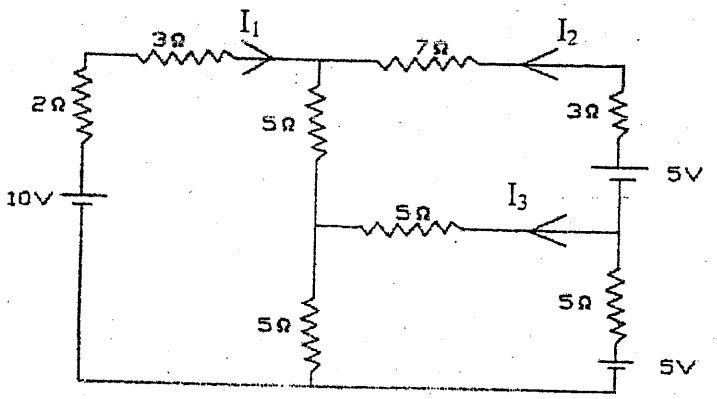
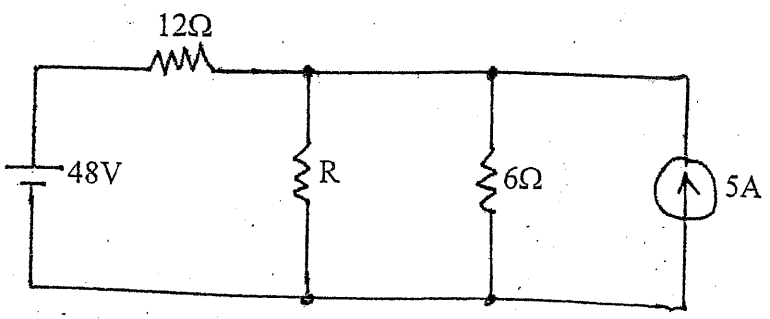


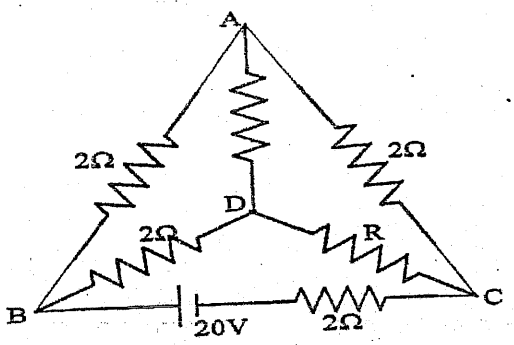
Fig: 1.2

2. a) The resistivity of a metal alloy is $50\times10^{-8}\Omega$-m. A sheet of material 15 cm long, 6 cm wide and 0.014 cm thick. Calculate the resistance in the direction: (a) along the length and (b) along the thickness. [6]

   b) Use Norton's theorem to calculate the value of R that will absorb maximum power from the circuit shown in the figure below. Also calculate the maximum power drawn by it. [6]



c) In the network shown below, find the value of resistance R and the current through it when the current through branch DA is zero. [4]



3. a) Find the current through the 10 Ω resistor using loop-current method? [8]

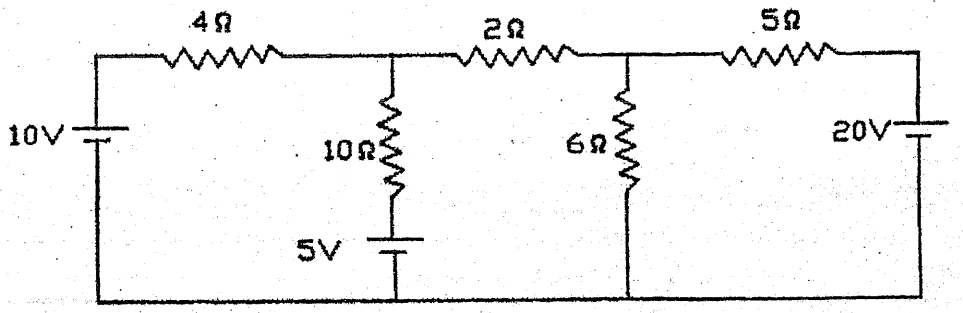
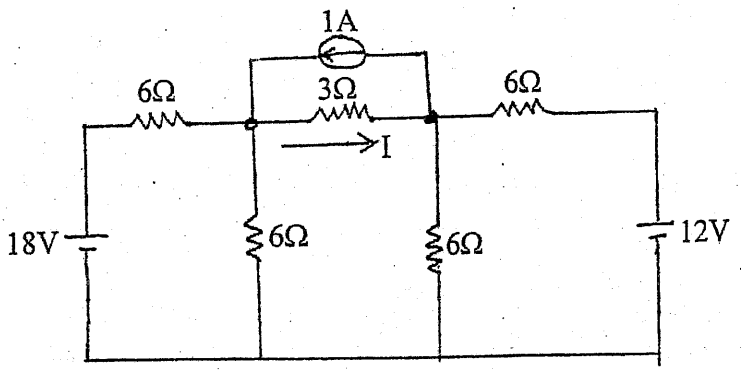


Fig: 3.1

b) Find the current I in the circuit of figure below by applying nodal voltage method. [8]



4. a) Explain generation of sinusoidal emf with diagram and define angular velocity. [6]

b) A sinusoidal voltage is applied to three parallel branches yielding branch currents, $i_1=14.14\ \text{Sin}(\omega t-45°)$, $i_2=28.3\ \text{Cos}(\omega t-60°)$ and $i_3=7.07\ \text{Sin}(\omega t+60°)$ (i) Find the complete time expression for the source current (ii) Draw the phasor diagram in terms of effective values. Use the voltage as reference. [6]

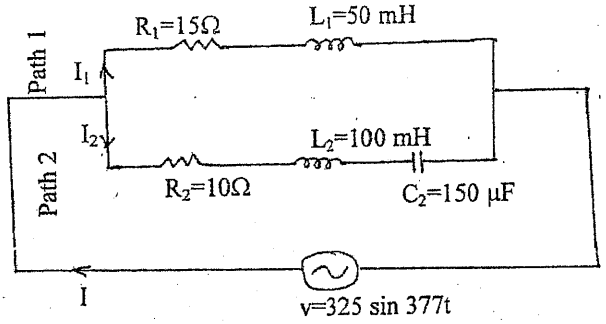
c) Define inductance and derive relation for connection of inductors connected in parallel connection. [4]

5. a) For the parallel circuit shown below, calculate: [8]

(i) RMS value for current, power factors and active power of path 1.

(ii) RMS value of current, power factor and reactive power of path 2.

(iii) RMS value of current and power factor of the whole circuit.



b) A three phase induction motor takes 50KW at 415V, 50Hz and a power factor of 0.72 lagging. Determine the KVAR rating of capacitor bank to improve the power factor to 0.9 lagging. What capacitance per phase is required if the capacitor bank is connected in star connection? What is the advantage of power factor correction from the source point of view and from the point of view of motor itself? [6+2]

6. a) In the network shown in figure below, determine: [8]

i) Total impedance
ii) Total current
iii) The current in each branch
iv) The overall power factor
v) Volt amperes, Active Power and Reactive Power

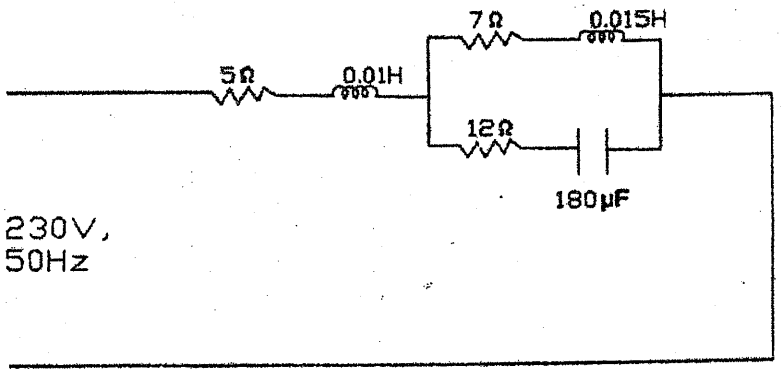


Fig: 5.1

b) In a 3-phase, 4 wire Wye connected system the phase voltage V_{ph} = 200V, and its frequency is 60Hz. The load impedance components are R_1 = 100Ω, R_2 = 100Ω, C_2 = 66.3 μF, R_3 = 100Ω, L_3 = 159.2mH. Calculate the three line currents and the neutral current. [8]

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Baishakh

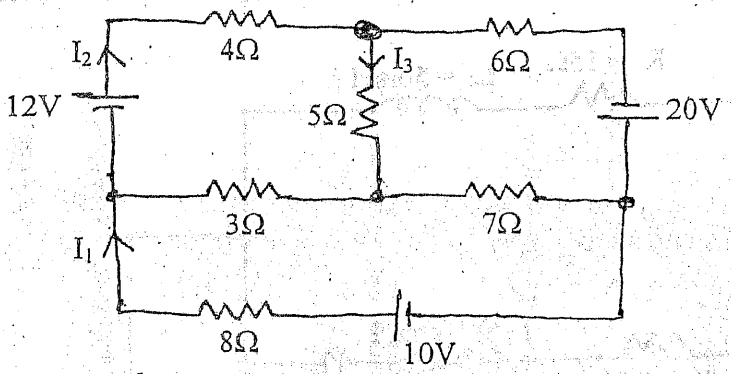
Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE, B.Agri	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering

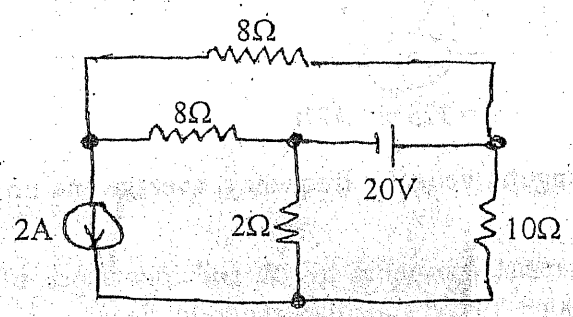
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Five** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) The temperature rise of a m/c field winding was determined by the measurement of the winding resistance. At 20°C the field resistance was 150Ω. After running the m/c for 6 hours at full load, the resistance was 175Ω. The temperature coefficient of resistance of the copper winding is 4.3×10^{-3}/k at 0°C. Determine the temperature rise of the m/c. [6]

   b) Find I_1, I_2, and I_3, in the circuit shown in the figure using Kirchhoff's law. [10]

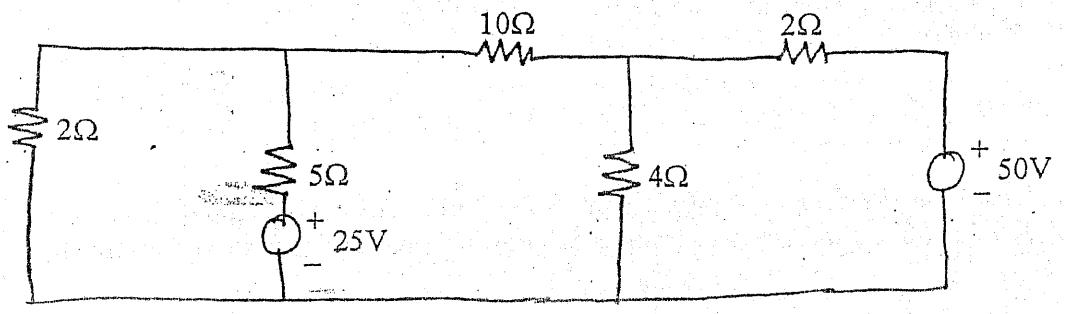


2. a) Use Superposition theorem to find the current flowing through the 10Ω resistor shown in the figure. [8]

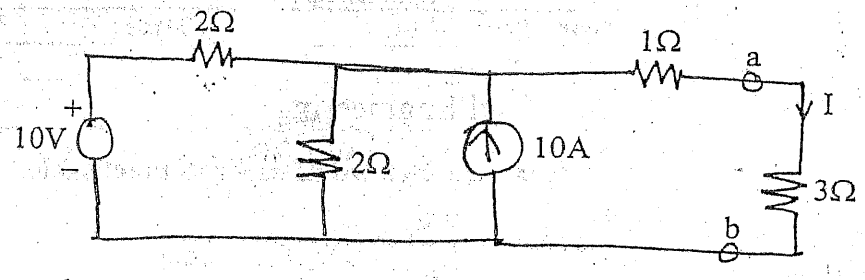


   b) State Thevenin's theorem and give the procedure for Thevenizing a circuit. Explain the major advantages offered by use of this theorem. [8]

3. a) Use the node voltage method (Nodal) to find the current flowing through 10Ω resistor in the network shown below. [8]



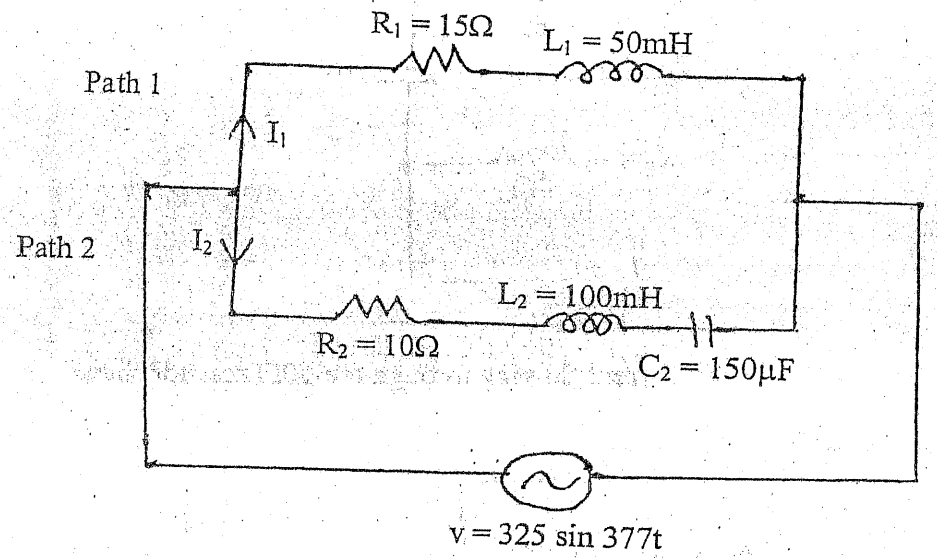
b) Determine the power dissipated in 3Ω resistor in the circuit shown below using Norton's theorem. [8]



4. a) An rms voltage of $100\angle 0°$ is applied to the series combination of $\bar{Z}_1$ and $\bar{Z}_2$ where $\bar{Z}_1 = 20\angle 30°$. The effective voltage drop across $\bar{Z}_2$ is known to be $40\angle -30°$V. Find the reactive component of $\bar{Z}_2$. [8]

b) For the parallel circuit shown below, calculate: [8]

i) RMS value of current, power factor, active and reactive power of path 1
ii) RMS value of current, power factor, active and reactive power of path 2
iii) RMS value of current, power factor, active and reactive power of the whole circuit



5. a) Define cycle, Time period, angular velocity, frequency, average and rms value of an alternating quantity. [6]

b) A series circuit consists of resistance equal to 4Ω and inductance of 0.01H. The applied voltage is 283 sin (300t + 90°)V. Calculate the followings: [10]

i) Power factor
ii) Expression for i(t)
iii) The power dissipated in the circuit
iv) Voltage drop across each elements and
v) Draw a phasor diagram

6. a) A 415V, 3 phase, 50Hz induction motor takes 50kW power from supply mains at 0.72 power factor lagging. Capacitors are connected in delta across the line to improve the overall power factor. Calculate the capacitance per phase in order to raise the power factor to 0.9 lagging. [8]

b) Three loads (31 + j59)Ω, (30 − j40)Ω and (80 + j60)Ω are connected in delta to a 3 phase, 200V supply. Find the phase currents, line currents and total power absorbed. [8]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BME	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

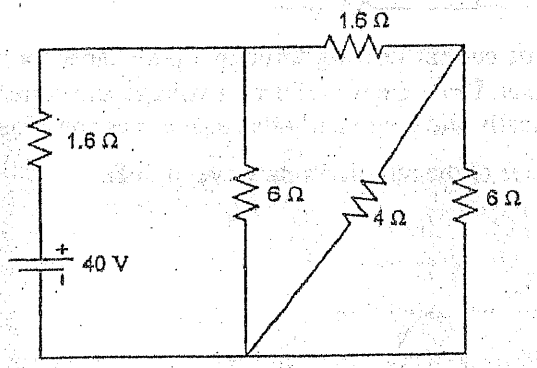
Subject: - Basic Electrical Engineering

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Five** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

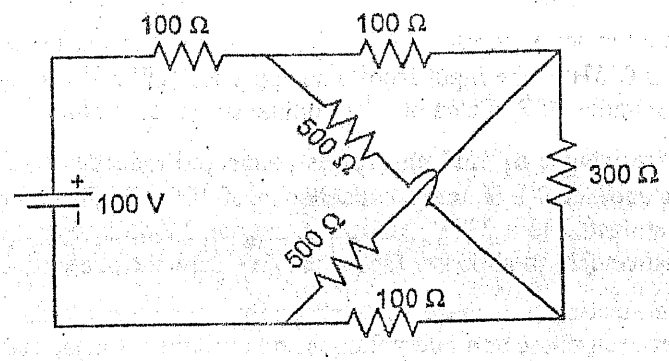
1. a) What do you mean by ideal and practical voltage source? Explain the effect of an internal resistance of a voltage source on its terminal characteristics. [2+3]

   b) The coil of a relay takes a current of 0.12A when it is at the room temperature of 15°C and connected across a 60-V supply. If the minimum operating current of the relay is 0.1A, calculate the temperature above which the relay will fail to operate when connected to the same supply. Resistance-temperature coefficient of the coil material is 0.0043 per °C at 6°C. [6]

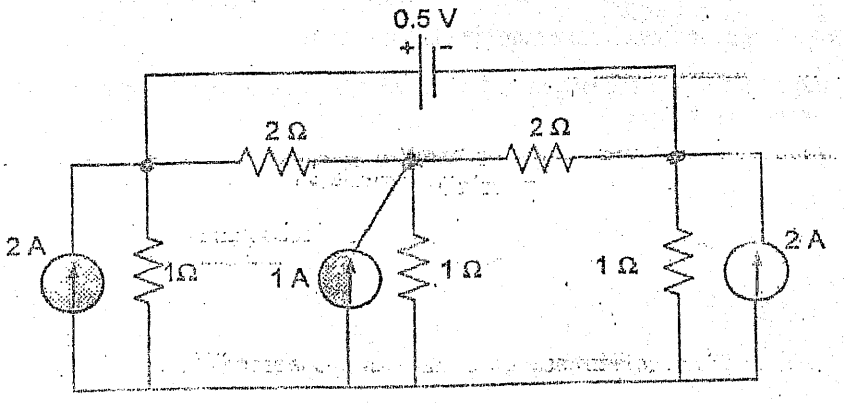
   c) Find the current through 4Ω resistance. [5]



2. a) State and explain Kirchoff's laws. Determine the current supplied by the battery in the circuit shown in figure below. [2+4]

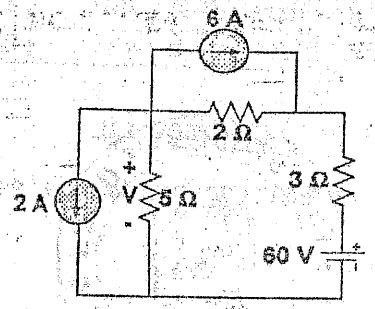


   b) Obtain the voltages at each nodes by applying nodal voltage analysis. [6]

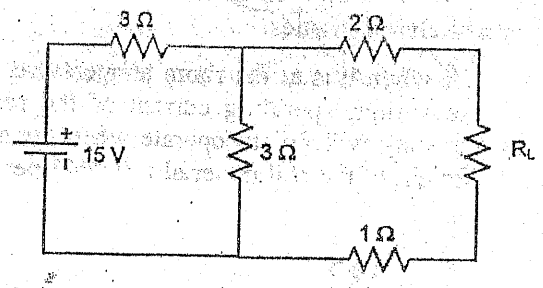


   c) State and explain Norton's theorem with an appropriate example. [4]

3. a) State superposition theorem. Apply superposition theorem to the circuit shown below to find the voltage drop V across the 5Ω resistor. [8]

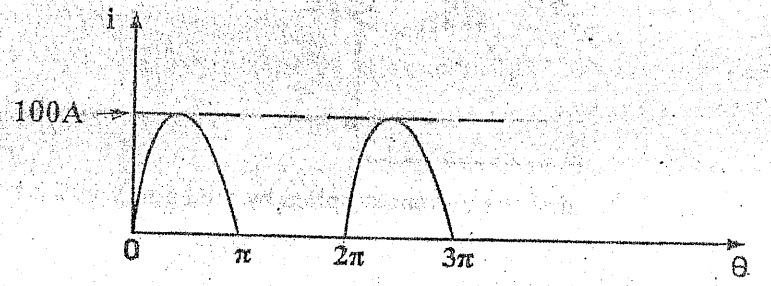


b) Find the value of R_L such that maximum power will be transferred to R_L. Find the value of the maximum power. [8]



4. a) Derive the equation for instantaneous current flowing through a pure capacitor when excited by AC sinusoidal voltage $v = V_m \sin\omega t$. Draw the waveform of voltage and current and phasor diagram of the circuit. Show analytically and graphically that it does not consume real power. [4]

b) Calculate the RMS and average values of the rectified sine wave of 50Hz. [6]



c) Two coils A and B are connected in series across a 240V, 50Hz supply. The resistance of A is 5Ω and the inductance of B is 0.015H. If the input from the supply is 3 kW and 2 kVAR, find the inductance of A and the resistance of B. Calculate the voltage across each coil. [6]

5. a) Two impedances consists of (resistance of 15Ω and series connected inductance of 0.04H) and (resistance of 10Ω, inductance of 0.1 H and a capacitance of 100 μF, all in series) are connected in series and are connected to a 230V, 50Hz a.c. source. Find: (i) current drawn, (ii) voltage across each impedance, (iii) total power factor and (iv) draw the phasor diagram. [6]

b) What are the two ways of connecting a 3-phase system? Draw their phasor diagrams and write down the relationship between phase and line voltages and currents for these systems. [4]

c) Define power factor and explain the disadvantages and causes of low power factor? [6]

6. a) List out the advantages of 3 phase system over single phase system. [4]

b) Explain 2-wattmeter method for the measurement of power in a balanced three phase load. How are the readings of the two wattmeters affected, when the load power factors is very low. [6]

c) A 220V, 3-phase voltage is applied to balanced delta connected 3-phase load of phase impedance $(15 + j20)\Omega$. Calculate: [6]

i) The phase voltages
ii) The power current in each line
iii) The power consumed per phase
iv) Draw the phasor diagram
v) What is the phasor sum of three line currents? Why does it have this value?

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