TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Ashwin

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

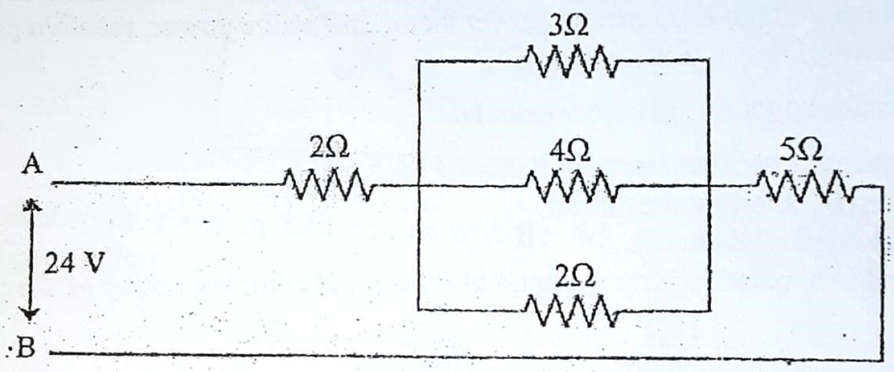
Subject: - Basic Electrical Engineering (*EE 451*)

- ✓ 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.*

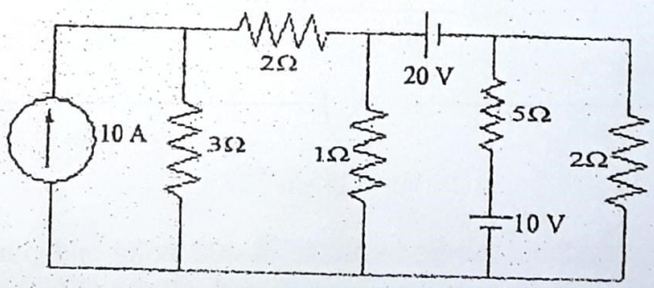
1. a) A coil is connected across a constant dc source of voltage 120V, draws a current of 12A at room temperature. After running 4 hours, temperature rises to 65°C and current reduces to 8A. Calculate the current when temperature increases to 80°C and the coefficient of resistance at 30°C and temperature coefficient of resistance at 40°C. [Consider room temperature = 25°C] [6]

   b) What are the differences between the electromotive force (Emf) and Potential difference (P.d)? [

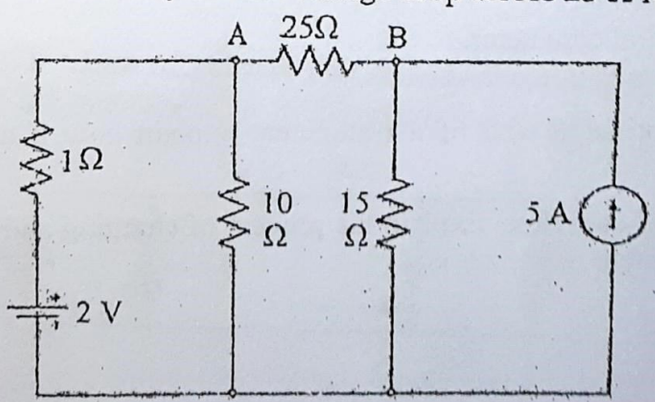
   c) Find the equivalent resistance R_{AB} in the figure shown, and power dissipated in the 3Ω resistor. [6]



2. a) Determine the power through 5 Ω resistor of the circuit given below using Nodel Analysis. [8]

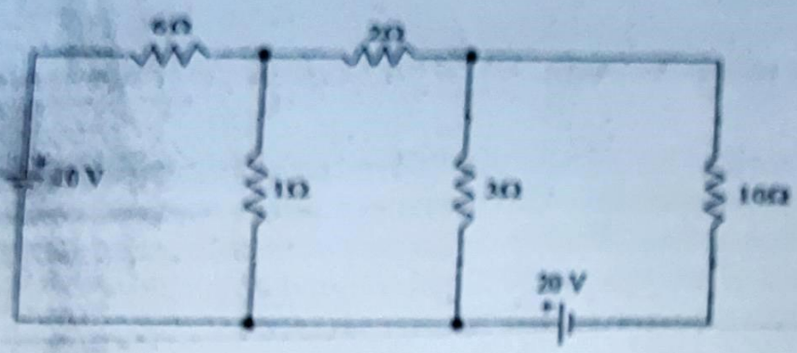


   b) Using Superposition theorem, find the voltage drop across 25 Ω resistor. [8]



3. a) Calculate the Average and rms value of the voltage signal given below. Also find the Form factor.

b) Determine the current through 10 Ω resistor of the circuit given below using Thevenin's theorem.

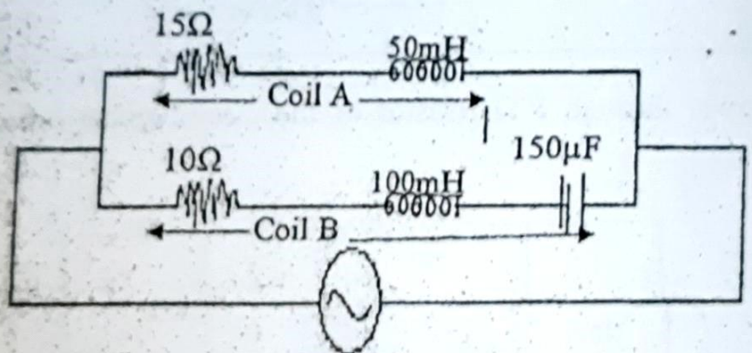


c) Define maximum power transfer theorem and derive the condition for maximum power transfer across the load resistance. [4]

4. a) A voltage v = 100 sin(377t) is applied across series circuit consisting of 5Ω resistor, 0.0318H inductor and a capacitor of 60μF. Calculate the time expression for current, phase between voltage and current, power factor and active power, reactive power and apparent power. Draw a phasor diagram. [8]

b) In the network shown in fig. below calculate.

i) Conductance, susceptance, admittance of each coil.
ii) Total current taken by the circuit.
iii) Power factor of the circuit.
iv) Active power, reactive power, apparent power and complex power of the circuit. [8]



5. a) In a 3-phase 4 wire system. the line voltage is 400 volts and pure resistive load of 10 Ω, 8Ω and 5Ω respectively are connected in each phase. Calculate

i) The current in each line.
ii) Current in the neutral conductor.
iii) Total power consumed in the load. [8]

b) Write the operating principle and of a wattmeter. Explain how it measures active power in a circuit. [4]

c) Define capacitance and capacitor. Explain the process of charging and discharging of capacitor with neat sketch. [4]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Jestha

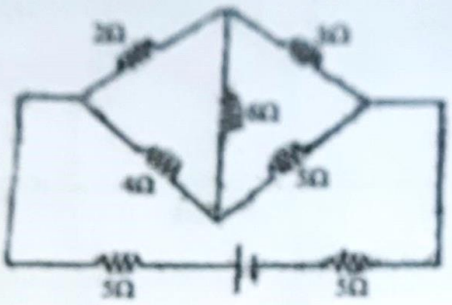
Exam.	[redacted]	Back	
Level	BE	Full Marks	80
Programme	BCE, BME, BEE	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electrical Engineering (SH 451)

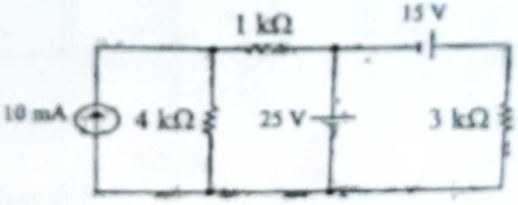
- Candidates are required to give their answers in their own words as far as practicable.
- *Attempt **All** questions.*
- *The figures in the margin indicate **Full Marks**.*
- *Assume suitable data if necessary.*

1. a) A field coil has a resistance of 173 ohms at 20°C. After working for 6 hours on full load, the resistance of the field coils increases to 215. Find the final temperature of the coil and mean rise of temperature of the coils. Take the temperature coefficient of resistance at 0°C is 0.00445/°C. [5]

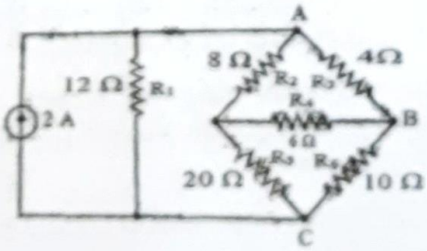
   b) Determine the equivalent resistance of the given circuit shown in figure below using KVL and KCL. [5]



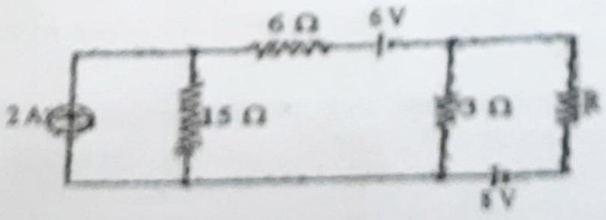
   c) Using superposition theorem find the current flowing through 1 ohm resistors as shown in figure below. [6]



2. a) Using mesh current method find the current following through resistors R_4 as shown in figure below. [8]



   b) Calculate the value of R which will absorb maximum power from the circuit as shown in figure below. Also calculate the value of this maximum power. [8]



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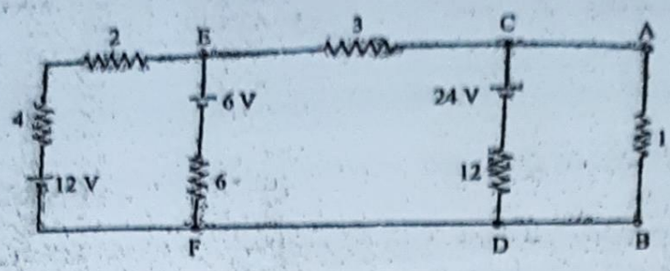
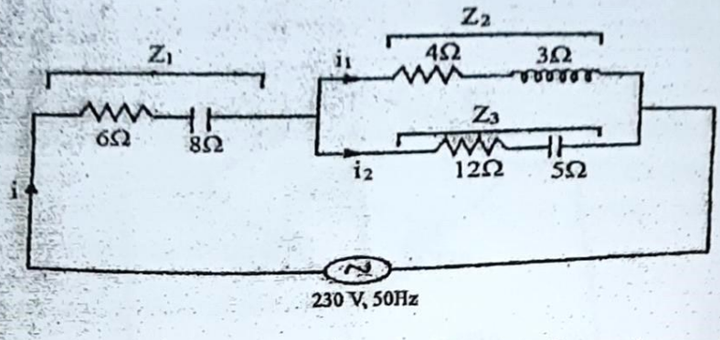
3. a) Use Norton's theorem to find the current flowing through 1 ohm resistor for the circuit shown in figure below. Given that all resistors are in ohms.

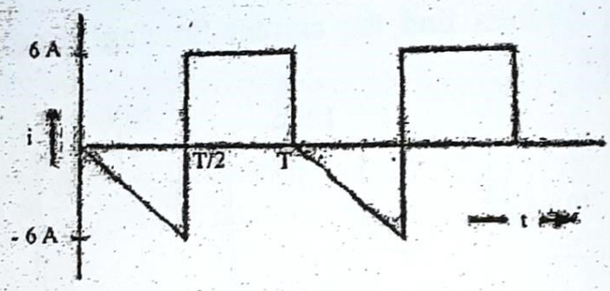


b) For the circuit shown in fig. below calculate:

i) Overall impedance of the circuit.
ii) Total current taken from supply and overall power factor of the circuit.
iii) Currents in each parallel branch.
iv) Active, reactive and apparent power of each path.
v) Construct phasor diagram for given circuit.



4. a) Find the average value and rms value of periodic waveform shown in figure below.



b) Find the expression for the equivalent inductance of two coils connected in series opposition.

c) An alternating source of e.m.f. V = 200sin (314t) volts is applied to a practical coil with resistance 20 ohm and inductance 0.1H respectively.

i) Expression for instantaneous current and power factor.
ii) Active, reactive and apparent power of the circuit.
iii) Voltage drop in resistor and inductor.

5. a) Define power factor and explain why, in general, it should be kept as high as possible in power supply systems.

The power supply to a 415V, 50Hz, 3-phase inductor motor is 50kW 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.

b) The three arms of a three-phase load each comprise resistance of 25 ohm and of inductance of 0.15 ohm in series with a 120 μF capacitor. The supply is 415 V, 50Hz. Calculate the phase current, line current and total power consumed by the load in star connection. Take phase sequence RYB. Also draw the phasor diagram.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Chaitra

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

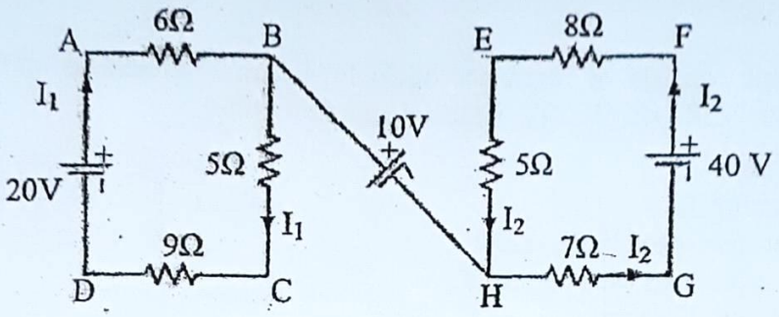
Subject: - Basic Electrical Engineering *(EE 451)*

- ✓ 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.*

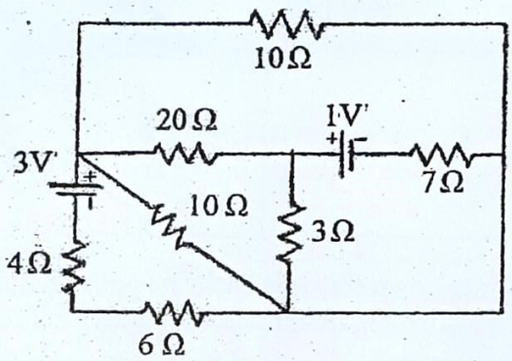
1. a) What do you mean by ideal and practical voltage source? Explain the effect of an internal resistance of a voltage source on its terminal characteristics. [4]

   b) 1 km of wire with circular cross sectional having diameter of 11.7 mm and of resistance 0.031 Ω is drawn, so that its diameter becomes 5 mm. What will be the new resistance? [6]

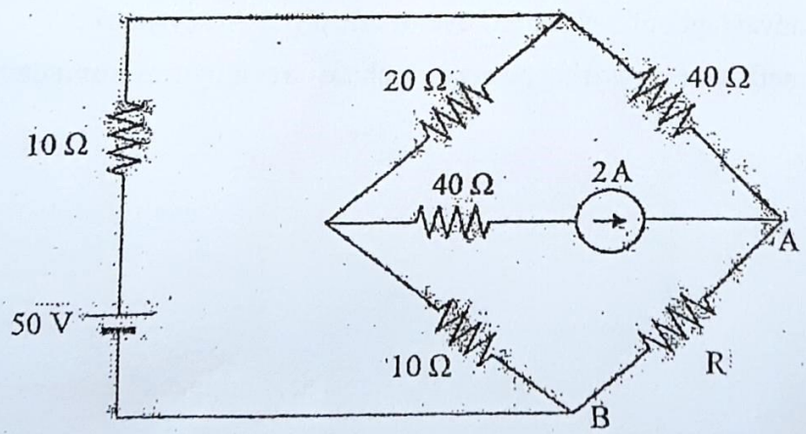
   c) Find the voltage across CE in the given circuit. [6]



2. a) Determine the current in 20 Ω resistor in the network shown below using Nodal analysis. [8]



   b) Calculate the power absorbed by R resistor using Thevenin's theorem. When (i) R = 50 Ω (ii) R = 100 Ω [8]



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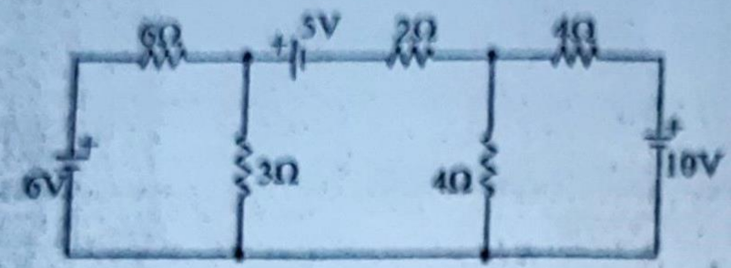
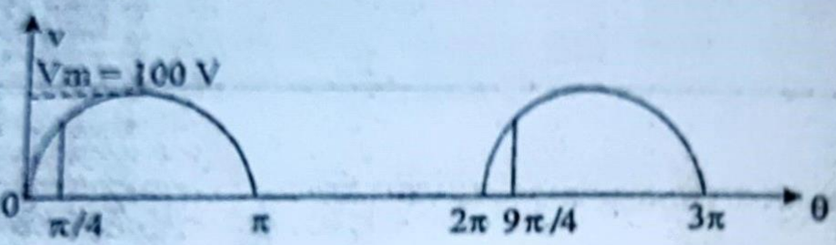
3. a) Find the current through 2Ω resistor of the circuit shown in figure given below using superposition theorem.



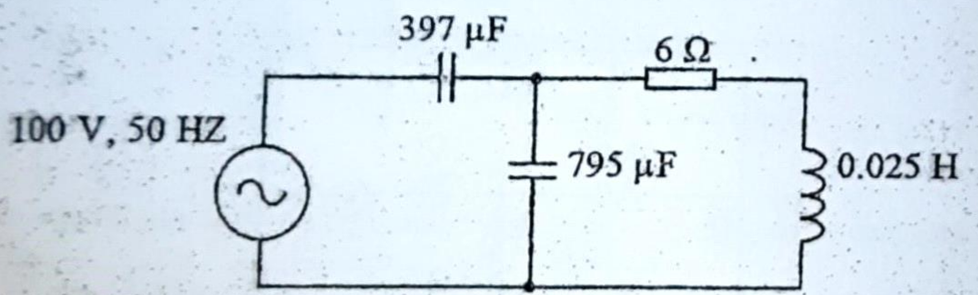
b) Define Rms value and Average value of AC. Calculate the Rms value, Average value, Peak and form factor of the voltage waveform given below.



4. a) A series circuit consists of resistance equal to 4Ω and inductance of 0.01H. The applied voltage is 283 sin (300t)V. Calculate the following:

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

b) Find the source current, power factor and total power consumed in the given circuit.



c) What is power factor? Write down the drawbacks of poor power factor. Explain how connecting a capacitor across the load improves the power factor.

5. a) A balanced star connected load is supplied from symmetrical 3-phase 400V system. The current in each phase is 30A and lags behind the phase voltage by 30°, Find the total power and draw phasor diagram of the current and voltages.

b) What are the advantages of 3 phase AC over single phase AC system?

c) Describe the method of measuring power in 3-phase circuit by two wattmeter method.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Poush

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

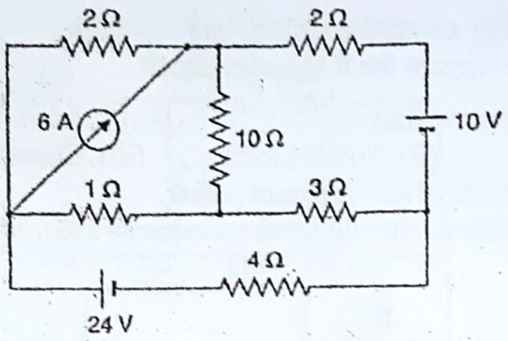
Subject: - Basic Electrical Engineering *(EE 451)*

- ✓ 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.*

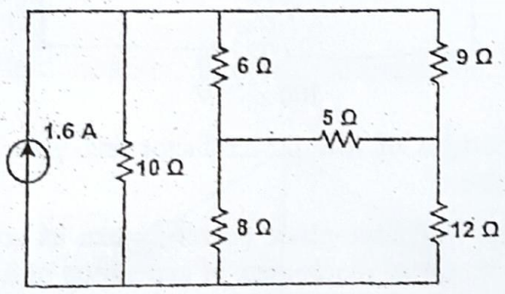
1. a) Distinguish among voltage, voltage drop, voltage rise and potential difference. [4]

   b) A 230V metal filament lamp has 60 cm long filament with cross-section $3\times10^{-6}cm^2$. Specific resistance of the filament at 20°C is 4×10^{-6} ohm-cm. If the working temperature of the filament is 2000°C, find the wattage rating of the lamp. Temperature coefficient of resistance of the filament material at 20°C is 0.0055/°C. [6]

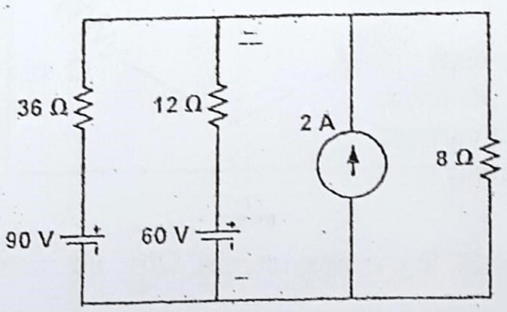
   c) Determine the current in 4Ω resistance of the circuit shown in figure below. [6]



2. a) Analysis the circuit of figure below, by the mesh method. From the results, calculate the current in the 5Ω resistance. [6]

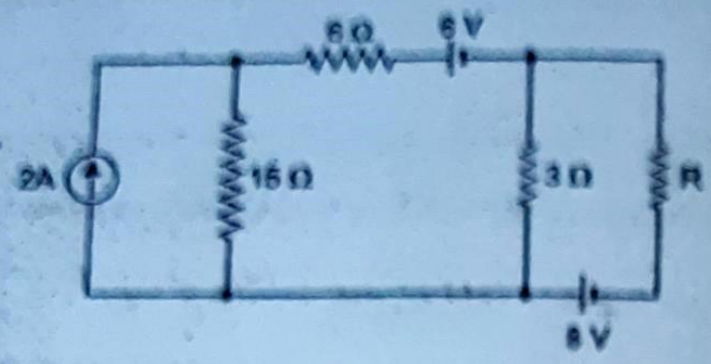


   b) Find current in 8Ω resistor of the network shown in figure below, using Superposition theorem. [6]



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

3. a) Calculate the value of R which will absorb maximum power form the circuit of figure. Also find the value of maximum power.



b) Derive an equation for the capacitance of a parallel-plate capacitor.

c) Derive an expression for the current produced in a pure Ohmic resistance when a sinusoidal voltage is applied across it. What is the power consumed by the resistor?

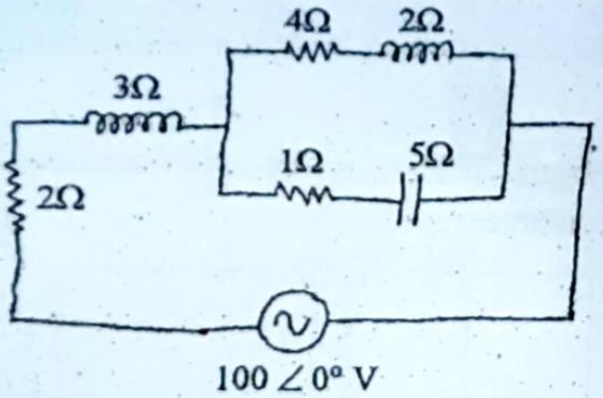
4. a) A capacitor 'C' is connected in series with a 40Ω resistor across supply of frequency 60 Hz. A current of 3A flows and the circuit impedance is 50Ω. Calculate

(i) the value of capacitance
(ii) the supply voltage
(iii) potential difference across the resistor and capacitor
(iv) draw the phasor diagram for R.C series circuit

b) For the circuit given below find

(i) Total impedance (ii) Total current (iii) Current in Parallel branches
(iv) Overall active, reactive and apparent power.

Also draw phasor diagrams showing various currents and voltage.



5. a) What are the disadvantages of low power factor and give the various methods to improve the power factor.

b) What are the advantages of three-phase power system as compared to single phase system? Explain the conceptual mechanism of generation of a 3 phase supply.

c) A 3-phase balanced delta connected load of phase impedance 15 + j20 ohm is connected to 220V supply. Calculate:

(i) Phase Voltages
(ii) Line and Phase currents
(iii) Power consumed per phase
(iv) Phasor sum of line currents

Draw the phasor diagram.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Kartik

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

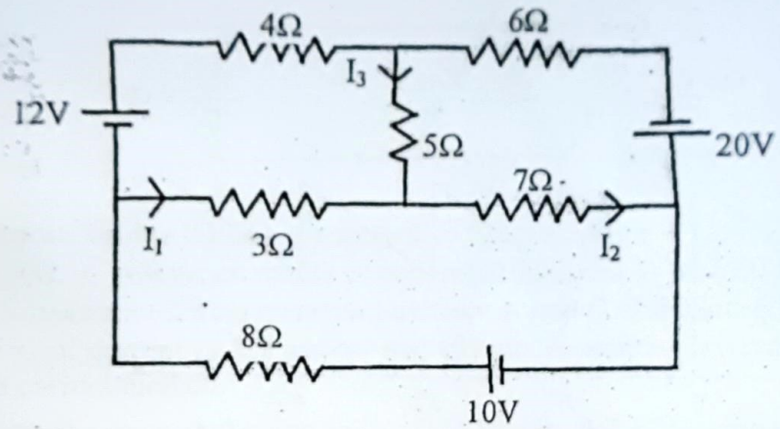
Subject: - Basic Electrical Engineering *(EE401)*

- ✓ 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.*

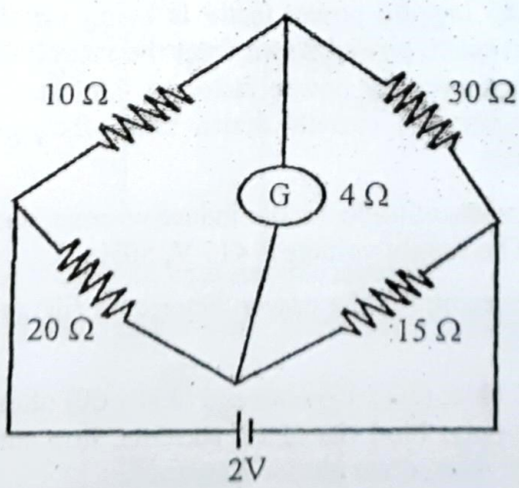
1. a) Define the temperature coefficient of resistance and explain the effect of temperature on resistance of a substance. [6]

   b) A coil has a resistance of 18 Ω when its mean temperature is 20°C and 20 Ω when its mean temperature is 50°C. Find its mean temperature rise when its resistance is 21Ω and the surrounding temperature is 15°C. [8]

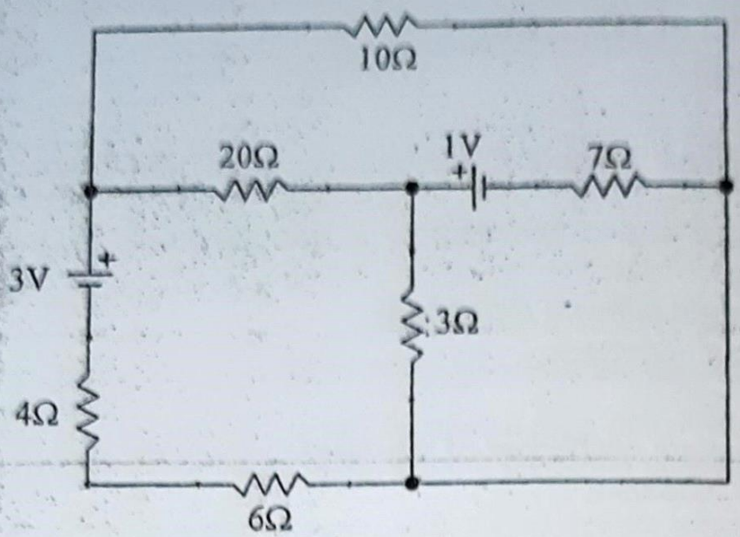
2. a) Find I_1, I_2, I_3 and Mesh current in the following circuits, using kirchhoff's law. [8]



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



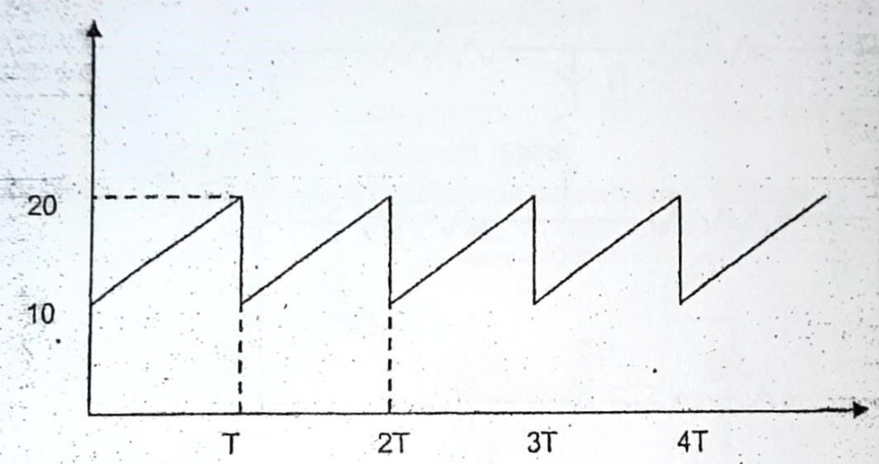
3. a) Determine the current in the 10Ω resistor across AB network shown below using thevenin's theorem. [8]



b) State and explain reciprocity theorem with a suitable examples.

4. a) Drive the equation for self-inductance in terms of number of turns and reluctance.

b) Calculate the form factor and peak factor of the following waveform.



c) The Circuit with impedances $Z_1 = (10 + j15)\ \Omega$ and $Z_2 = (6 - j8)\ \Omega$ are connected in parallel. If the supply current is 20 A, what is the power dissipated in each branch?

5. a) A 100 kW load at 0.85 lagging power factor is being supplied by a 230 V, 50Hz 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.

b) A three- phase load consists of three similar inductive coils, each of resistance 50 ohm and inductance 0.3H. The supply voltage is 415 V, 50Hz.

Calculate :(i) the line current; (ii) the power factor; and (iii) the total power when the load is star – connected.

c) Three loads of (31+j 59) ohm, (30-j 40) ohm and (80+ j 60) ohm are connected on delta to a 3- phase, 230V supply. Find the phase currents, line currents and power when phase sequence is RYB. Also, draw phasor diagram.

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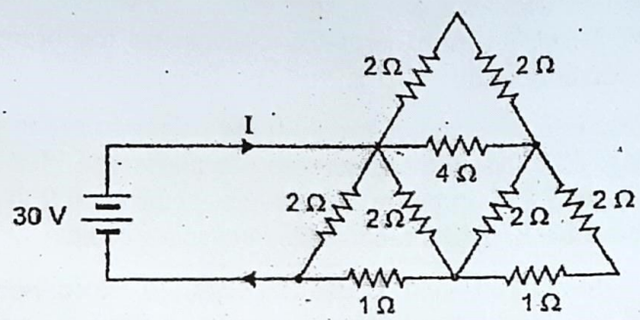
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Baishakh

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

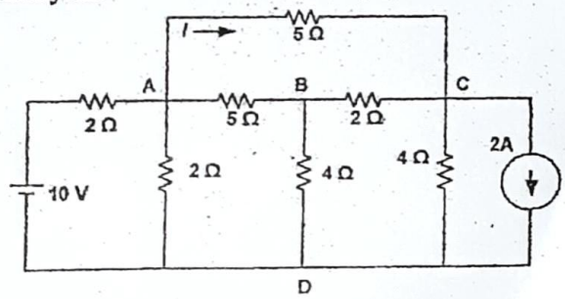
Subject: - Basic Electrical Engineering *(EE 451)*

- ✓ 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.*

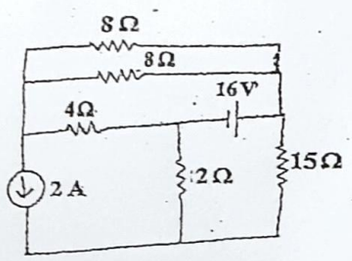
1. a) With proper mathematical equations and graphs describe ideal and practical voltage and current source. Also explain the method for converting practical voltage source into current source and vice versa. [5]
   b) Explain the effect of temperature on resistance. [5]
   c) Find the current supplied by the 30 V source in the circuit shown in figure. [6]



2. a) Wheatstone bridge ABCD is arranged as follows: AB = 1 Ω; BC = 2 Ω; CD = 3 Ω; DA = 4Ω. A resistance of 5Ω is connected between B and D. A 4-volt battery of internal resistance 1 Ω is connected between A and C. Calculate (i) the magnitude and direction of current in 5Ω resistor and (ii) the resistance between A and C by using branch current method. [6]
   b) Calculate the current flowing in the 5 Ω branch AC of the circuit shown in figure below using nodal analysis. [6]

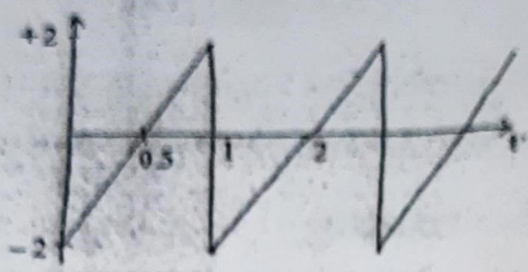


   c) State and explain Norton's theorem with suitable example. [4]
3. a) Find the power loss in 15 ohm resistor using Thevenin's Theorem. [8]



b) Derive an expression for the energy stored in the magnetic field of an inductor.

c) Find the rms and average value of waveform given below in figure.



4. a) Two coils A and B are connected in series across 240 V, 50 Hz supply. The resistance of A is 5 Ω and the inductance of B is 0.015 H. 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.

b) Two impedances Z_1 and Z_2 are connected in parallel. The first branch takes a leading current of 16 A 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 complex expressions for branch and total currents, and for the circuit constants.

5. a) A 400 V, 50 Hz 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 capacitance in order to improve the power factor to 0.9 lagging using (i) star-connected capacitor bank (ii) Delta-connected capacitor bank.

b) Three phase loads (31 + j59) Ω, (30 – j40) Ω and (80 + j60) Ω are connected in Delta to a 3 phase 200V, 50 Hz supply. Find the phase current, line current and power consumed. Also calculate overall power factor of the circuit.

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2077 Chaitra

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

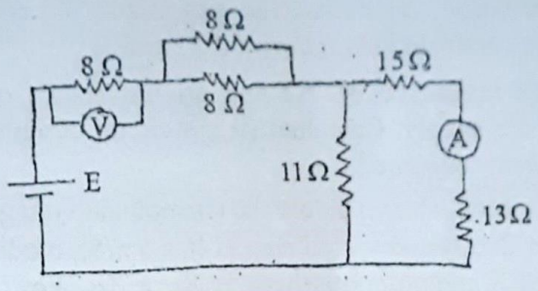
Subject: - Basic Electrical Engineering *(EE 451)*

- ✓ 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.*

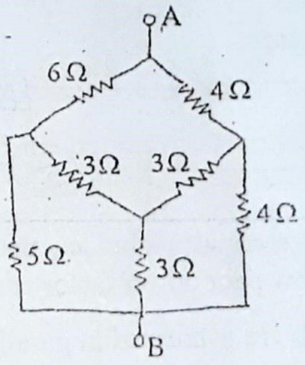
1. a) Explain constituent parts of an electric system with neat sketch. [5]

   b) A resistor coil has a resistance of 20 ohm when its mean temperature is 15°C and 24 ohm when its mean temperature is 65°C. Find its mean temperature rise when its resistance is 26 ohm and the surrounding temperature is 10°C. [5]

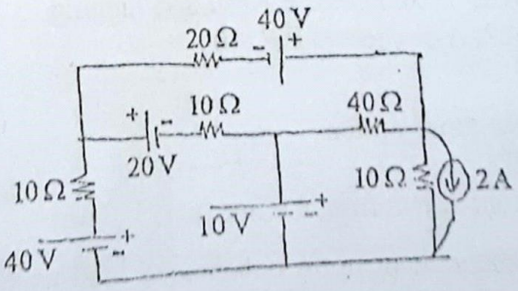
   c) A source of unknown emf is connected as shown in the figure. If the voltage drop across 8 ohm resistor measured by the voltmeter is 20V, what will be reading on the ammeter? Also what is the emf of the source? [6]



2. a) Find the equivalent resistance across A-B using Star/Delta Transformation. [8]



   b) Determine the power consumption of 20 ohm resistor of the given network using nodal method. [8]



b) Prove the total equivalent inductance of two inductive coils joined in series will be Leq = L_1+L_2--2M, where L_1 and L_2 are coefficient of self-inductance of 1st and 2nd coil and M is the coefficient of mutual inductance.

c) Find the form factor and peak factor of sinusoidal voltage v = 10 Sin(wt).

4. a) A coil and non-inductive resistor are connected in series across a 200V, 50Hz supply. The voltages across the coil and resistor are 120V and 140V respectively. If the supply current is 0.5A, calculate (i) the resistance and inductance of the coil; (ii) the power dissipated in the coil; (iii) the power factor of the coil; (iv) the power factor of the circuit.

b) A RC series circuit (R_1 = 40Ω, C = 10μF) and RL series circuit (R_2 = 50Ω, L = 0.2Ω) are connected in parallel to each other and a source of 100V, 50Hz is applied across the overall circuit. Calculate (i) current drawn by each branch and overall current taken from supply (ii) power factor of circuit (iii) Active , Reactive and Apparent power

5. a) Three impedances of (10+j10)Ω, (12+j12)Ω and (2+j2)Ω are connected in delta to a 3-phase system with line voltage 400V. Calculate all the phase currents, line currents, active powers, reactive powers and apparent power.

b) How can we measure the power factor angle of the circuit using two wattmeter power measurement method?

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Baishakh

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

Subject: - Basic Electrical Engineering *(EE 451)*

- ✓ 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.*

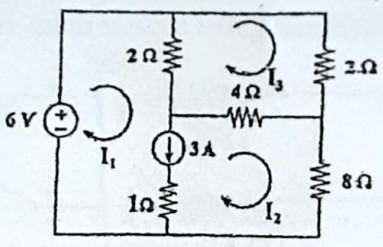
1. a) What is electric current? How the concept of electric current was originated. [4]

   b) The filament of a 60W, 230V lamp has a normal working temperature of 2000°C. Take the temperature coefficient to be 0.005 at room temperature 20°C. Find the current which flows at the instant of switching on the supply to the cold lamp. [6]

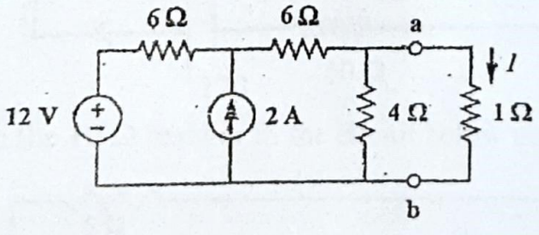
   c) Define the terms power and energy and state their practical units.
   What is monthly energy consumption and the monthly electrical charges of using the following electrical equipment at Rs 7 per kWh?

   (i) Ten 1200Watt heaters for 5 hours
   (ii) Six 50 Watt TV for 4 hrs.
   (iii)Five 400 Watt fans for 10 hours.
   (iv)4800Watt electric clothes dryer for 2 hours. [2+4]

2. a) Using mesh analysis determine the current through all the resistors. [6]

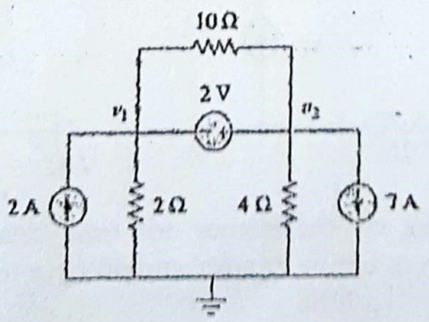


   b) Using thevenin's theorem find the current flowing through load resistance of value 1Ω connected across terminals ab for the network shown below. [6]



   c) Explain reciprocity theorem with example. [4]

3. a) Use nodal analysis to find the current through 4Ω resistor for the network shown below. [8]



b) Prove the total equivalent inductance of two inductive coils joined in series will be $L_{eq} = L_1+L_2-2M$, where L_1 and L_2 are coefficient of self-inductance of 1st and 2nd coil and M is the coefficient of mutual inductance.

c) Find the form factor and peak factor of sinusoidal voltage $v = 10\ Sin(wt)$.

4. a) A coil and non-inductive resistor are connected in series across a 200V, 50Hz supply. The voltages across the coil and resistor are 120V and 140V respectively. If the supply current is 0.5A, calculate (i) the resistance and inductance of the coil; (ii) the power dissipated in the coil; (iii) the power factor of the coil; (iv) the power factor of the circuit.

b) A RC series circuit ($R_1 = 40\Omega$, $C = 10\mu F$) and RL series circuit ($R_2 = 50\Omega$, $L = 0.2\Omega$) are connected in parallel to each other and a source of 100V, 50Hz is applied across the overall circuit. Calculate (i) current drawn by each branch and overall current taken from supply (ii) power factor of circuit (iii) Active , Reactive and Apparent power

5. a) Three impedances of $(10+j10)\Omega$, $(12+j12)\Omega$ and $(2+j2)\Omega$ are connected in delta to a 3-phase system with line voltage 400V. Calculate all the phase currents, line currents, active powers, reactive powers and apparent power.

b) How can we measure the power factor angle of the circuit using two wattmeter power measurement method?

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Bhadra

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

Subject: - Basic Electrical Engineering *(EE451)*

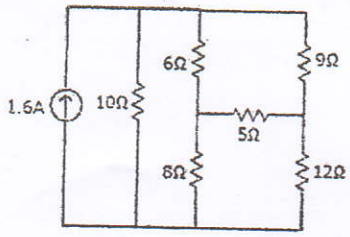
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Differentiate between electro motive force and potential difference. [4]

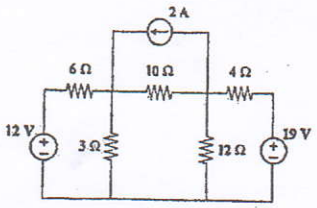
   b) The current in the field winding of a motor at 20°C is 2A. After running the motor for 6 hours at full load the current falls to 1.75A. If voltage applied across the field winding is 240V, determine the temperature rise of the winding. The temperature coefficient of resistance of the copper winding 0°C is 0.00428/°C. [6]

   c) A d.c circuit comprises two resistors, A of value 25 ohms, and B of unknown value, connected in parallel, together with a third resistor C of value 5 ohms 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 (a) the value of resistor B, (b) the voltage applied to the ends of the whole circuit, (c) the current in each resistor. [6]

2. a) Use loop current method to calculate the current through the 5Ω resistance for the Network shown below. [6]

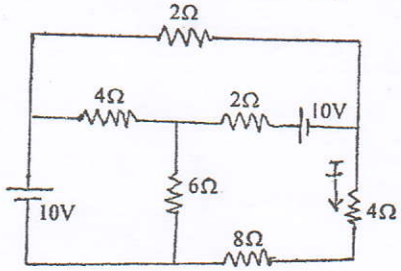


   b) Find the current through 10 Ω resistor using superposition theorem. [6]



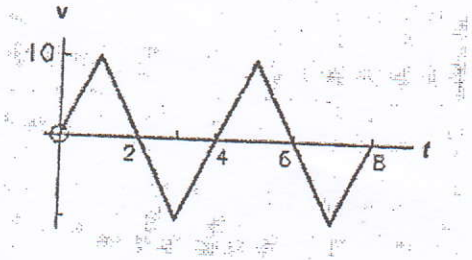
   c) State maximum power transfer theorem and also derive the condition at which maximum power is delivered to the load. [4]

3. a) Determine the value of 'I' shown in figure below, by using Norton's theorem. [6]



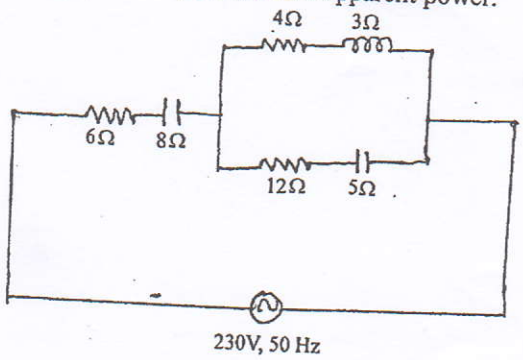
b) Derive the equivalent inductance when two inductors are connected in series aiding connection considering the mutual inductance. [6]

c) A generator produces a voltage wave as a function of time as shown in figure below. The voltage is impressed across 10Ω resistor. How much energy is delivered to resistor in 2 second? [4]



4. a) Three filament bulbs A, B, C when connected separately to v = 326 sin (314t), takes currents of 5A, 10A and 15A respectively whereas power absorbed by those bulbs are 40 watt, 60 watt and 100 watt respectively. When these three bulbs are connected in series with the same source, calculate (i) total power factor of the circuit (ii) Expression for instantaneous current (iii) power absorbed by this combination [8]

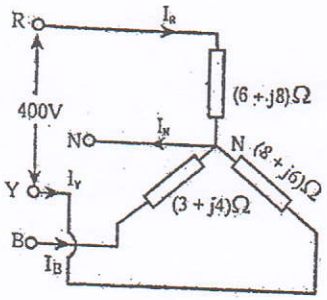
b) For the circuit shown in figure below, calculate (i) overall impedance of circuit. (ii) Total current taken from supply and overall power factor of circuit. (iii) current in each parallel branch (iv) Active, reactive and apparent power. [8]



5. a) 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 per phase



b) How power factor is improved in three phase system. What value of Capacitance must be connected in parallel with a load drawing 1kW at 70% lagging power factor from a 208V, 60Hz Source in order to raise the overall power factor to 91%. [4+4]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Baishakh

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

Subject: - Basic Electrical Engineering *(EE451)*

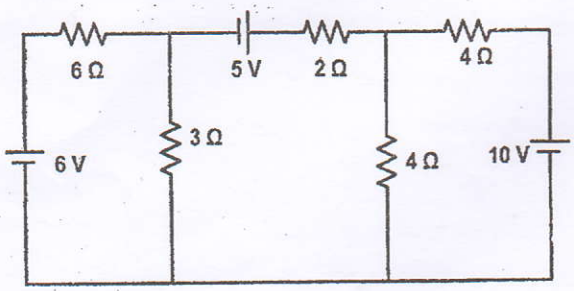
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Derive a relation between the known resistance R_1 at t_1 °C and the unknown resistance R_2 at t_2 °C, when α_0 is not known. [6]

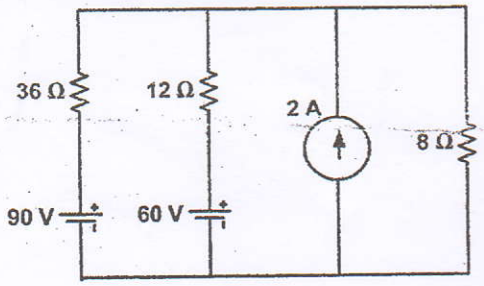
   b) Explain the process of source conversion. How is it helpful in solving electrical networks? [4]

   c) A circuit, containing of three resistances 12 Ω, 18 Ω, and 36 Ω respectively jointed in parallel, is connected in series with a fourth resistance. The whole is supplied at 60 V and it is found that the power dissipated in the 12 Ω resistance is 36 W. Determine the value of the fourth resistance and the total power dissipated in the group. [6]

2. a) Find the branch currents in the circuit of given figure below by using nodal analysis? [6]

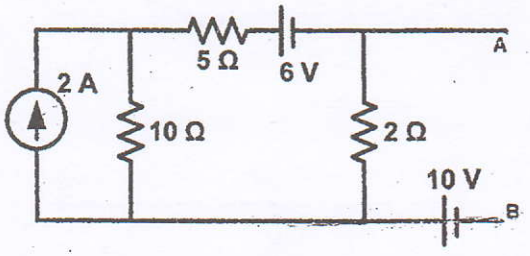


   b) Find current in 8 Ω resistor of the network shown in figure below using superposition theorem. [6]



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

3. a) In the network shown in figure below, find resistance R_L connected between terminals A and B so that maximum power is develop across R_L. What is the maximum power? [6]



b) Derive an expression for the energy stored in the magnetic field of an inductor. [4]

c) Derive an expression for the current drawn by a pure capacitor when connected across a voltage. Explain with the help of a power diagram that the value of average power drawn by the capacitor during one cycle is zero. [6]

4. a) A resistance of 20 Ω, 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 (a) impedance (b) Current (c) Voltage across R, L and C and (d) Power factor. Also calculate the total power consumed by the circuit. [6]

b) A coil resistance 50 Ω and inductance 0.318 H is connected in parallel with a circuit comprising a 75 Ω resistor in series with a 159 μF capacitor. The resulting circuit is connected to a 240 V, 50 Hz ac supply. Calculate: (a) The supply current (b) The circuit impedance, resistance and reactance (c) Power factor and (d) Total power consumed by the circuit. [6]

c) Describe the method of measuring power in 3-Φ circuit by using two watt meters. [4]

5. a) A 220 V, 50 Hz single phase ac motor draws a power of 10 kW at a power factor of 0.75 lagging. Calculate the change in current taken from the supply and the new power factor when a 250 μF capacitor is connected in parallel with the motor. If the motor is supplied through a cable of 0.05 Ω resistances, calculate the power loss in the cable before and after connecting the capacitor. [8]

b) A three-phase Δ-connected load consists of three similar coils, each of resistance 50 Ω and inductance 0.3 H. The supply is 415 V, 50 Hz. Calculate (i) The line currents (ii) The power factor (iii) Total active and reactive powers when the load is Δ-connected. Draw the phasor diagram. [8]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Bhadra

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

Subject: - Basic Electrical Engineering *(EE451)*

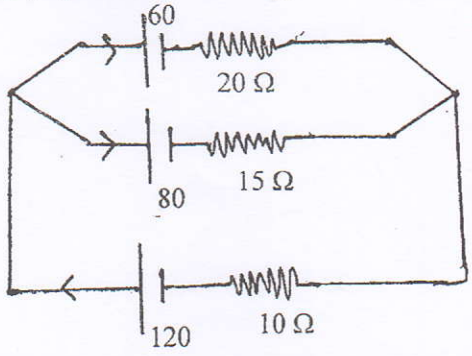
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Define the terms of source transformation with suitable example. [4]

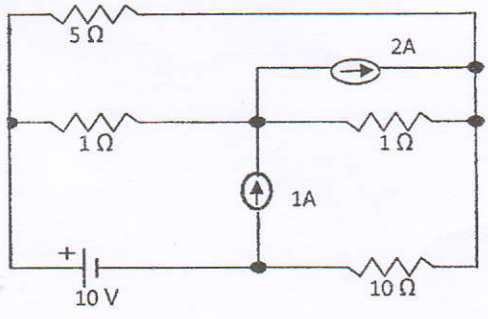
   b) The current in the field winding of a motor at 20°C is 2 A. After running the motor for 6 hrs at full load the current falls to 1.75 A. If the voltage applied across the field winding is 240 V, determine the temperature rise of the winding. The temperature coefficient of resistance of the copper winding at 0°C is 4.28×10^{-3}/K [6]

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

2. a) Find the current supply by each source using Kirchhoff's law. [6]

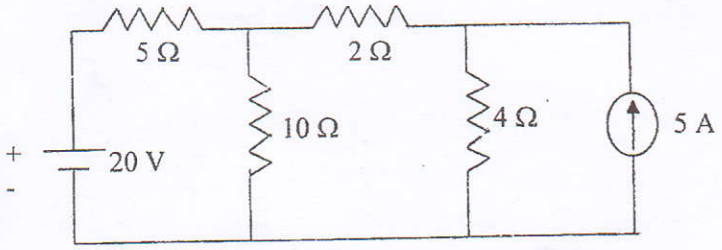


   b) Find the current in the 10 Ω resistor in the circuit below using Superposition theorem. [6]

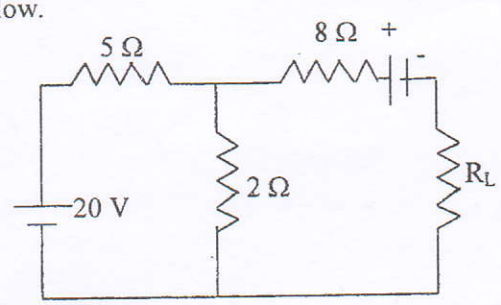


   c) Define capacitance and find the expression for capacitance in terms of physical dimension of capacitor also deduce energy stored in capacitor. [4]

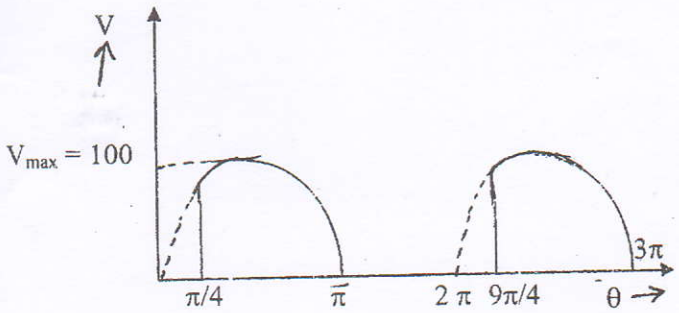
3. a) Use Norton's theorem to find the current through 10 ohm resistor for the network shown below. [8]



b) State the maximum power transfer theorem and find the value of R_L to obtain the maximum in R_L power and also find the value of this maximum power for the network shown below. [8]



4. a) Calculate the peak factor and form of the waveform shown below. [4]



b) A coil and non-inductive resistor are connected in series across a 200 V, 50 Hz supply. The voltage across the coil and resistor are 120 V and 140 V respectively. If the supply current is 0.5 A, calculate : (i) the resistance and inductance of the coil; (ii) the power dissipated in the coil; (iii) the power factor of the coil; (iv) the factor of the circuit. [6]

c) Two impedances given by $Z_1 = (10+j5)$ and $Z_2 = (8+j6)$ are joined in parallel across a voltage of $v = (200+j0)$ volts. Calculate the circuit its phase and the branch currents, total power consumed by the circuit. Draw the phasor diagram. [6]

5. a) Three phase loads $(6+j8)\Omega$, $(8+j6)\Omega$ and $(4-j3)\Omega$ are connected in delta to a 3 phase 110 V supply. Find the phase currents, line currents and total power consumed. [6]

b) Derive the relation between tan ϕ and the two wattmeter reading w1 and w2 for a balanced three-phase load having leading power factor. [6]

c) Show, with the aid of a phasor diagram, how the power factor of a load can be improved by connecting a capacitor in parallel with it. [4]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BGE, BME	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE451)*

- ✓ 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) Differentiate between electromotive force and potential difference. What do you mean by ideal and practical current and voltage sources? [2+2]

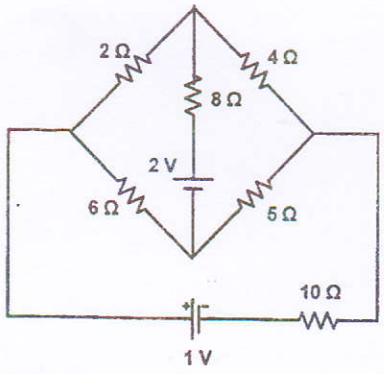
   b) Two resistors, made of different materials having temperature coefficients of resistance $\alpha_1 = 0.004$ / °C and $\alpha_2 = 0.005$ / °C, are connected in parallel and consume equal power at 15°C. What is the ratio of power consumed in resistance R_2 to that in R_1 at 70°C? [6]

   c) Define the terms power and energy and state their practical units.

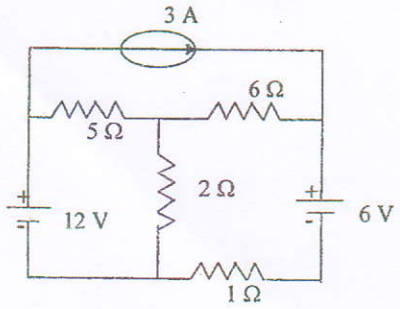
   What is the total cost of using the following at Rs. 7 per kWh?

   (i) A 1200 Watt toaster for 30 minutes.
   (ii) Six 50 Watt bulbs for 4 hrs.
   (iii) A 400 Watt washing machine for 45 minutes.
   (iv) 4800 Watt electric clothes dryer for 20 minutes. [6]

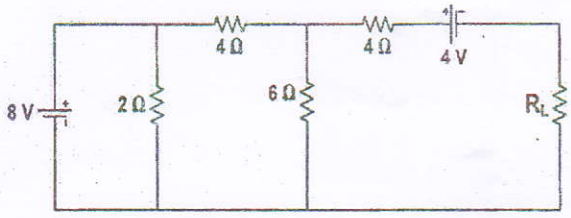
2. a) Find Current in 1 V source of the network shown in figure below, using Superposition theorem. [8]



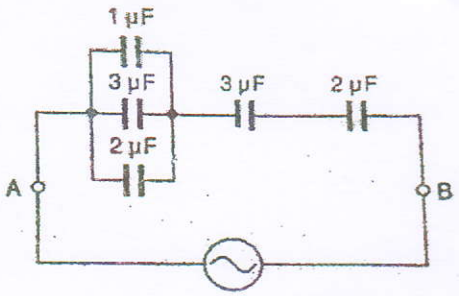
   b) Use nodal analysis to find the current through 6Ω resistor for the network shown below. [8]



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 circuit shown in figure below. [8]



b) Calculate the equivalent capacitance of the circuit shown below across the point AB. [4]



c) Define average value and rms value of voltage in 1-phase sinusoidal a.c. system. [4]

4. a) An inductive coil with impedance $Z_1 = (8+j4)\ \Omega$ is connected in parallel with a capacitive circuit having an impedance of $Z_2 = (6-j7.5)\ \Omega$, is connected in series with an inductive coil $Z_3 = (2.8+j6.1)\ \Omega$. Find (i) total impedance, (ii) total circuit current and branch currents, (iii) power taken by each impedance and the total power, (iv) overall power factor and (v) voltage drop across each impedance. [8]

b) A single phase a.c. voltage of 100 s in (314t-30°)v is supplying a circuit consisting of two parallel branches. Current through the parallel branches are 10sinwt A and 15sin (wt-60°)A. determine rms value of current drawn from the circuit and construct phasor diagram of current and voltages. What is the equivalent impedance of the circuit? [3+3+2]

5. a) Three non-inductive loads of 8 kW, 6 kW and 4 kW are connected between the neutral and the red, yellow and blue phase respectively of a 3 phase 4 wire system with line voltage of 400 V. Find out (i) current in each line and (ii) the current in neutral conductor. [8]

b) A single phase 50 Hz motor takes 20 A at 0.75 power factor lagging from a 230 V sinusoidal supply. Calculate the kVar and capacitance of capacitor to be connected in parallel to raise the power factor to 0.9 lagging. What is the new supply current? [8]

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5 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Bhadra

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

Subject: - Basic Electrical Engineering *(EE451)*

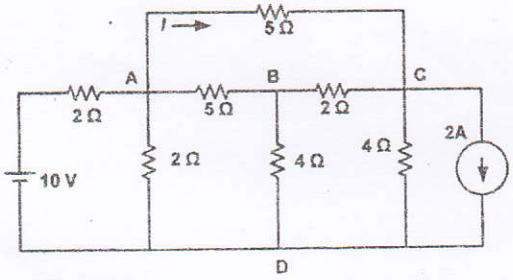
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What do you mean by ideal and practical voltage source? Explain the effect of an internal resistance of a voltage source on its terminal characteristic. [4]

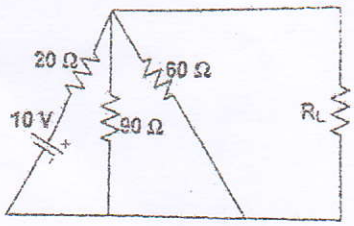
   b) Define temperature co-efficient of resistance. The field winding of a dc motor connected across 230 V supply takes 1.15 A at room temperature of 20°C. After working for some hours the current falls to 0.96 A, the supply voltage remaining constant. Calculate the final working temperature of field winding. Resistance temperature co-efficient of copper at 20°C is 1/254.5. [6]

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

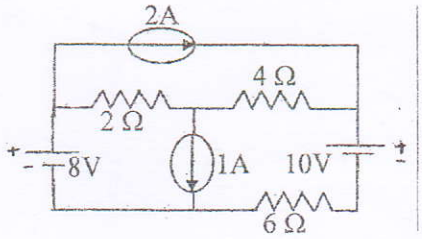
2. a) Calculate the current flowing in the 5Ω branch AC of the circuit shown in figure below using nodal analysis. [8]



   b) Calculate the value of R to receive maximum power and maximum power received by it for the circuit shown below. [8]



3. a) Use loop current method to calculate the current through the 4 Ω resistance for the network shown below. [8]



b) State and explain Norton Theorems with the help of suitable example. [4]

c) What is a parallel-plate capacitor? How do you define its capacitance? [4]

4. a) Derive the equation for inductance in terms of its physical dimensions. [4]

b) Derive the equation for instantaneous current flowing through a pure inductor when excited by AC sinusoidal voltage V = Vm Sinwt. Draw the waveform of voltage, current and power. Show analytically and graphically that it does not consume real power. [6]

c) A series circuit consists of a resistance equal to 4Ω and inductance of 0.01 H. The applied voltage is v = 283 sin (300t+90°) volts. Find [6]

(i) the power dissipated in the circuit,
(ii) the expression for i(t)
(iii)power factor

5. a) Define power factor and explain its significance. A single phase load of 5Kw operates at a power factor 0.6 lagging. It is proposed to improve the power factor to 0.95 lagging by connecting a capacitor across the load. Calculate the KVAr rating of the capacitor. [2+6]

b) A star connected alternator supplies a delta connected load. The impedance of the load branch is (8+j6) Ω. The line voltage is 230 volt. Determine [8]

(i) Current in the load branch
(ii) Power consumed by load
(iii) Power factor of the load
(iv) Reactive power of the load

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11

06 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BME, BGE	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

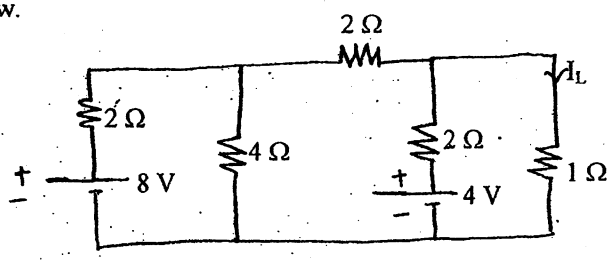
Subject: - Basic Electrical Engineering *(EE451)*

- ✓ 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) At room temperature of 20°C, the current flowing at the instant of switching of a 40W filament lamp with 220V supply is 2A. The filament material has a resistance temperature coefficient of 0.005/°C at 20°C. Calculate the working temperature of filament and current taken by it during normal working condition. [6]

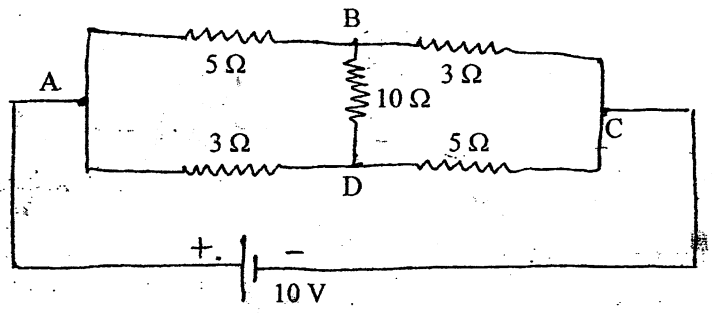
   b) Derive the formula I = n.A.e.V where the symbols used have their usual meaning. [5]

   c) Apply KVL and KCL to determine current I_L through 1Ω resistor in the network shown below. [5]



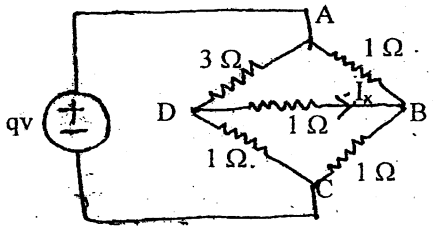
2. a) Define maximum power transfer theorem and derive the condition for maximum power transfer across the load resistance. [8]

   b) Find the current in t he branch BD of the circuit given below by using Thevenin's. [8]



3. a) Derive the equation for instantaneous current flowing through a pure inductor when excited by an ac sinusoidal voltage $v = v_m \sin wt$. Draw the wave form of voltage and current and also show analytically and graphically that it does not consume real power. [8]

   b) Find the value of I_x in the circuit shown below by the method of nodal analysis. [8]



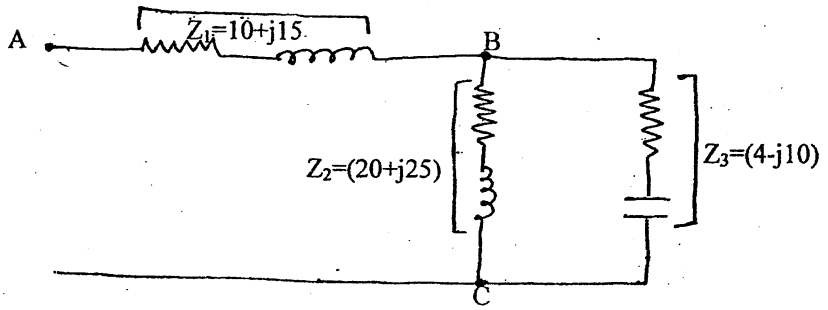
4. a) What do you understand by dynamically and statically induced emfs? Hence define self and mutually induced emf and magnetic coupling between two coils. [4]

   b) Derive an expression for the equivalent inductance of two inductors when they are connected in series (i) adding combination (ii) Opposing combination [6]

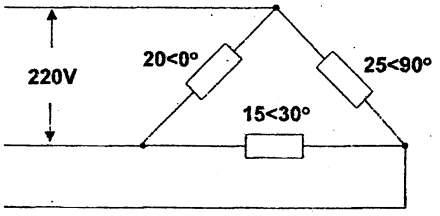
   c) A 10 Ω resistor is connected in series with a 100μF capacitor to a 230 V, 50 Hz supply. Find (i) The impedance (ii) Current (iii) Power factor (iv) Phase angle (v) Voltage across the resistor and the capacitor. [6]

5. a) Three elements, a resistance of 100 Ω, an inductance of 0.1H and a capacitance of 150 μF are connected in parallel to a 230 V, 50 Hz supply. Calculate the : (i) Current in each element (ii) Supply current (iii) Phase angle between the supply voltage and the supply current with the help of a phasor diagram. [6]

   b) In the circuit shown in figure below, determine the equivalent impedance that appears across the terminals AC. [4]



   c) For the 3-phase delta connected circuit below. Determine the line currents and total active, reactive and apparent power. [6]



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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Bhadra

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

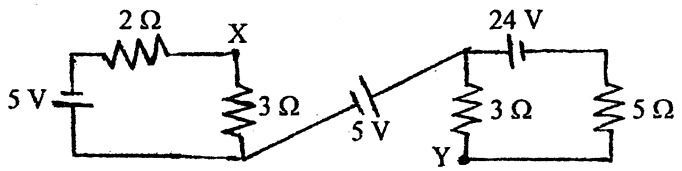
Subject: - Basic Electrical Engineering *(EE451)*

- ✓ 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.*

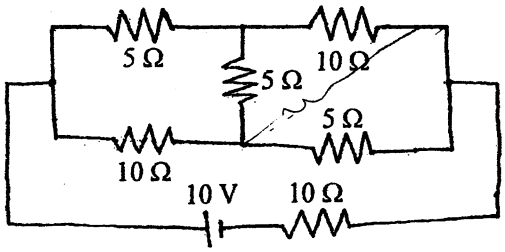
1. a) Define ideal current source. Show that if α_1 is the resistance temperature coefficient of a conductor at temperature t_1 °C then resistance temperature coefficient at t_2 °C is given by $\frac{\alpha_1}{1+\alpha_1(t_2-t_1)}$. [5]

   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 Ω and the ambient temperature is 15°C. [5]

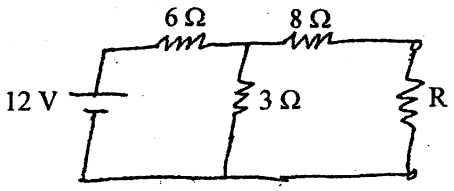
   c) Find V_{XY} in the figure. [5]



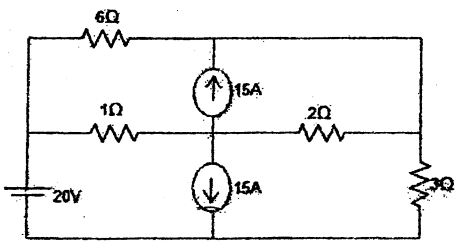
2. a) Find equivalent resistance of the given network. [5]



   b) Determine the value of R for maximum power to R and calculate the power delivered under this condition. [4]



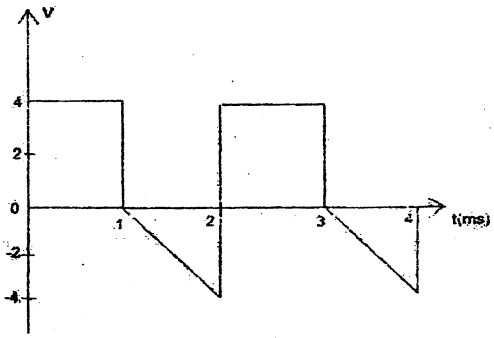
   c) Calculate the voltage drop across 3 Ω resistor using Superposition Theorem in the circuit given below. [6]



3. a) Explain super node and needs with suitable example. [4]

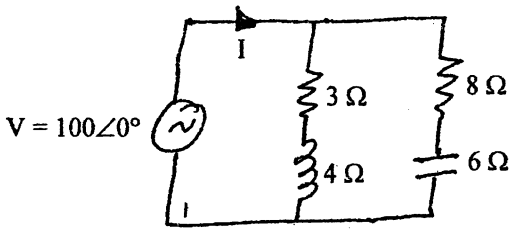
b) Define capacitance and inductance. Also classify the capacitors on the basis of geometrical shapes. [4]

c) Calculate the Rms value and Average value of the voltage wave given below and hence compute the form factor. [8]

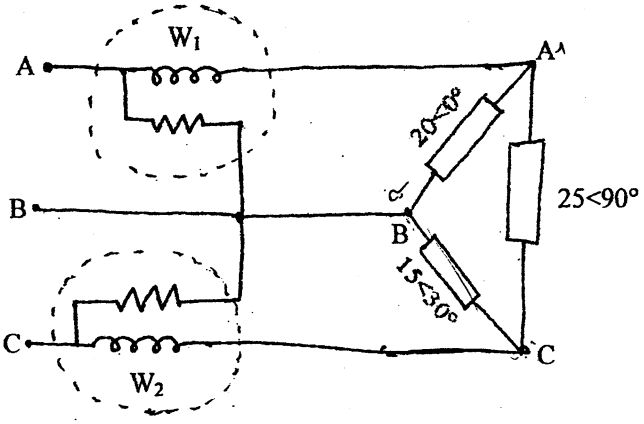


4. a) Explain the operation of purely capacitive circuit excited by a sinusoidal source and hence prove that average power consumed by such circuit is zero. Draw necessary waveforms. [6]

b) For the circuit given below, calculate the current I. Draw the phasor diagram of the circuit. [6]



c) The supply system is 230 V, 3-phase, 50 Hz. Determine the readings of wattmeters W_1 and W_2. Phase sequence is AB-BC-CA. [7]



5. a) Derive the equation for the instantaneous current when A.C. voltage is supplied to a series R-L circuit. Draw phasor diagrams and analyze power in the circuit. [6]

b) Calculate the amount of current through the neutral of a balanced 3-phase star connected circuit. Also verify with the phasor diagram. [3]

c) An electric circuit is being supplied by an a.c. source of 100 V rms. The circuit has a resistance of 10 Ω, inductor of 12 Ω reactance and capacitance of 8 Ω reactance connected in series. Compute the active power and power factor of the circuit. [6]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Magh

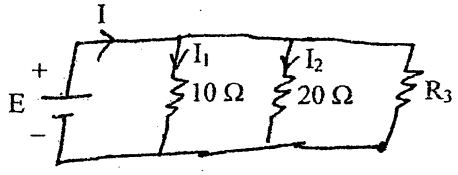
Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BGE, BME	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE451)*

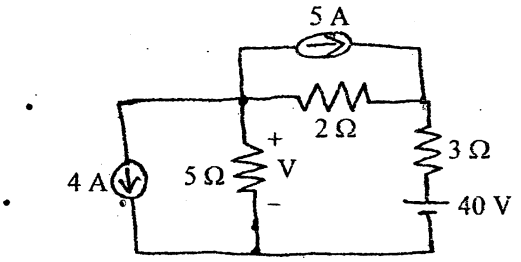
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) A coil connected to a constant DC supply of 100 V drew a current of 13 A at room temperature of 25°C. After some time, its temperature increased to 70°C and current fell to 8.5 A. Find the current it will draw when its temperature will further rise to 80°C. Also find the temperature coefficient of resistance of the coil at 20°C. [6]

   b) Given the information provided in figure, calculate R_3, E, I and I_2. Equivalent resistance of the circuit is 4 Ω. [5]

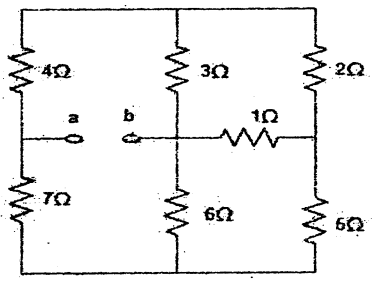


   c) Apply superposition theorem to the circuit shown below to find the voltage drop V across the 5 Ω resistor. [5]



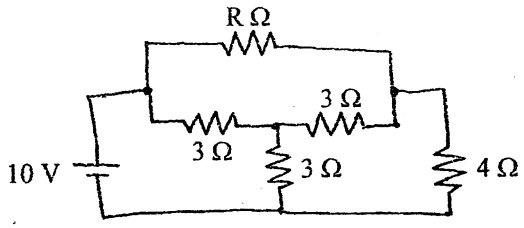
2. a) Why does the terminal voltage of a real voltage source decrease with increase in load current? Explain how a practical voltage source can be converted into a practical current source. [6]

   b) Using star-delta transformation, find the equivalent resistance between terminals 'a' and 'b'. [6]

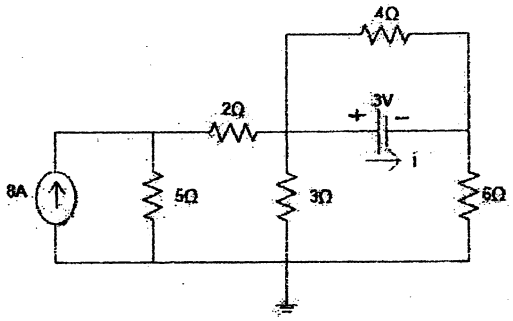


c) A capacitor with capacitance of 2 μF is connected in series with another capacitor whose capacitance is C_x. If the equivalent capacitance of the combination is 1.5 μF, calculate the value of C_x. What would be the equivalent capacitance if they were connected in parallel? [4]

3. a) Determine the value of R in the given network such that 4 Ω resistor consumes maximum power. [5]



b) Find the value of 'I' through the voltage source using Nodal analysis. [8]



4. a) An alternating current of frequency 50 Hz has a maximum value of 120 A. Write down the equation for its instantaneous value. Find also the instantaneous value after 1/360 sec and the time taken to reach 96 A for the first time. [6]

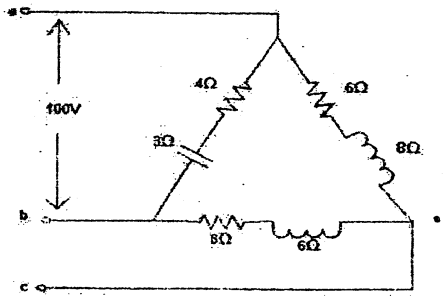
b) A coil is connected in series with a resistance of 30 Ω across 240 V, 50 Hz power supply. The reading of a voltmeter across coil is 180 V and across resistor is 130 V. Calculate resistance and reactance of coil. Also find power factor of whole circuit. [6]

c) Construct a phasor diagram of currents and voltages in a R-L-C series circuit. Assume $R = |0.8X_L| = |X_C|$. [4]

5. a) Explain disadvantages and causes of low power factor. [4]

b) A series combination resistor R and inductance L is driven by 25 V, 50 Hz supply. The power delivered to R and L are 100 W and 75 VAR. Determine the value of capacitance of a capacitor to be connected in parallel with source to improve its power factor to 0.9 (lagging). [5]

c) Discuss the advantages of three phase ac system over single phase ac system. For the given unbalanced delta connected load, find the phase currents, line currents and total power consumed by the load when phase sequence is abc. Construct the phasor diagram of currents and voltages in the load. [2+6+2]



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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Bhadra

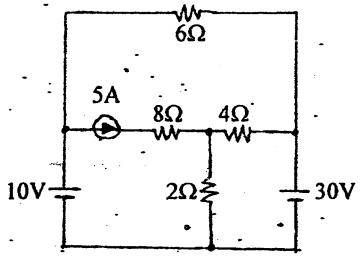
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BME, BGE	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE451)*

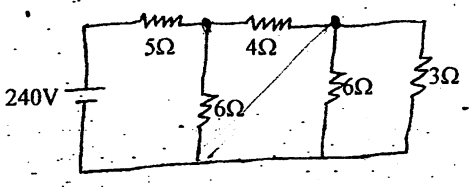
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Distinguish between series and parallel connection of resistances. Derive the equation for finding equivalent resistance of three resistances connected in (i) series (ii) Parallel. [4]

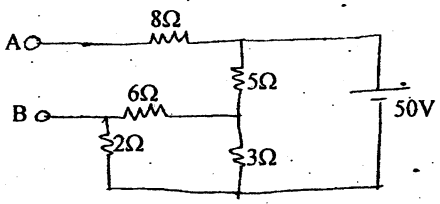
   b) Find all branch currents using mesh analysis method in the following circuits. [6]



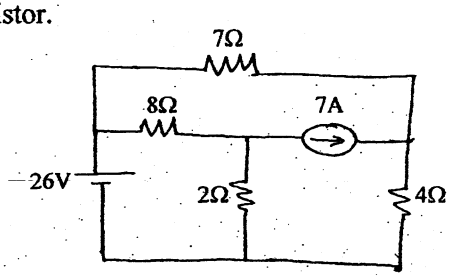
   c) Find the circuit current and current through each branch using branch current method. [6]



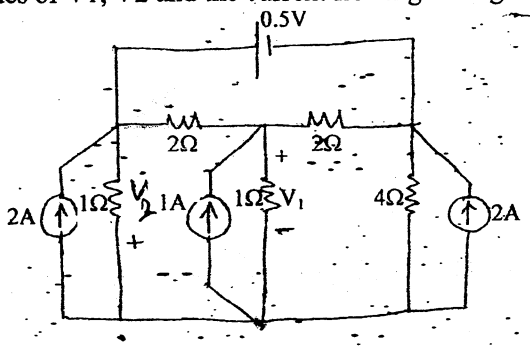
2. a) Find the Norton's equivalent resistance between the terminals A and B in the given circuit. [4]



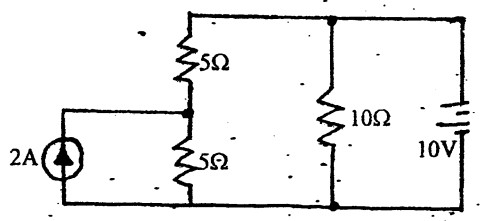
   b) Use mesh analysis to find the current flowing through 2Ω resistor and the potential across the 4Ω resistor. [6]



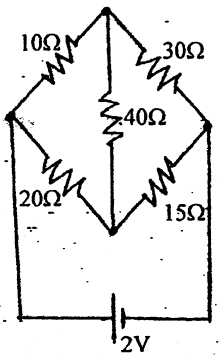
c) Find the values of V1, V2 and the current flowing through the 4Ω resistor. [6]



3. a) Using superposition theorem, determine currents in all the resistors of the following circuit. [6]



b) The resistance of the various arms of a wheat stone bridge are shown in figure below. The battery has an emf of 2V. Using Thevenin's theorem, determine the value and direction of the current in the 40Ω resistor. [6]



c) Derive the expression for energy stored in an inductive coil. [4]

4. a) Two currents i_1 and i_2 are given as, $i_1 = 10 \sin(314t + \pi/14)$ A and $i_2 = 8 \sin(313t - \pi/3)$A. Find (i) $i_1 + i_2$ and (ii) $i_1 - i_2$. Write answer in sinusoidal form. Also draw phasor diagrams of the processes. [4+4]

b) Two impedances $Z_1 = (10+j5)$ and $Z_2 = (8+j6)$ are joined in parallel across a voltage of $V = 200 + j0$. Calculate magnitudes and phases of circuit current and branch currents. Draw phasor diagram. [8]

5. a) An inductive load of 4 KW at a lagging power factor of 0.8 is connected across a 220V, 50Hz supply. Calculate the value of the capacitance to be connected in parallel with the load to bring the resultant power factor to 0.95 lagging. [4]

b) Three impedances of $(10+j10)\Omega$, $(12+j12)\Omega$ and $(2+j2)\Omega$ are corrected in delta to a 3-phase system with line voltage 400V. Calculate all the phase currents, line currents, active powers, reactive powers and apparent powers. [8]

c) Explain two wattmeter method for a balanced star connected load. How can this method be used for measurement of three phase power. [4]

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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BGE, BME	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

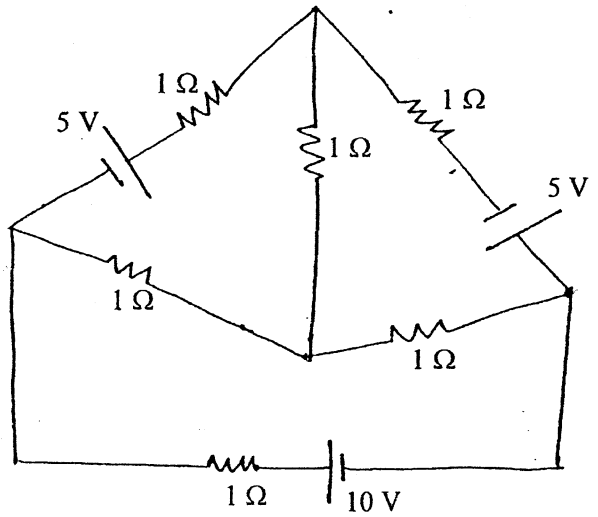
Subject: - Basic Electrical Engineering *(EE451)*

- ✓ 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 are ideal current and voltage sources and explain how do they differ from the practical ones? [4]

   b) A piece of resistance wire, 15.6 m long of cross-sectional area 12 mm^2 at a temperature of 0°C, passes a current of 7.9 A when connected to DC supply at 240 V. Calculate (i) resistivity of the wire (ii) the current when the temperature rises to 55°C. The temperature coefficient of the wire is 0.000 29 Ω/C° [6]

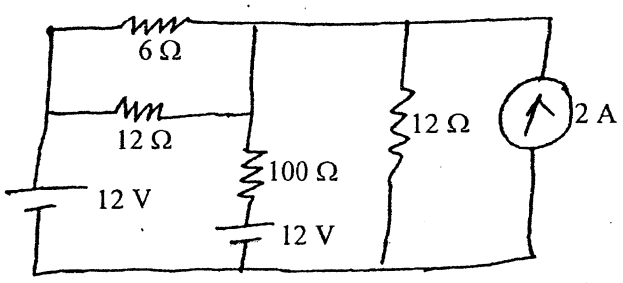
   c) Find the current flowing from the 10 V source using KVL. [6]



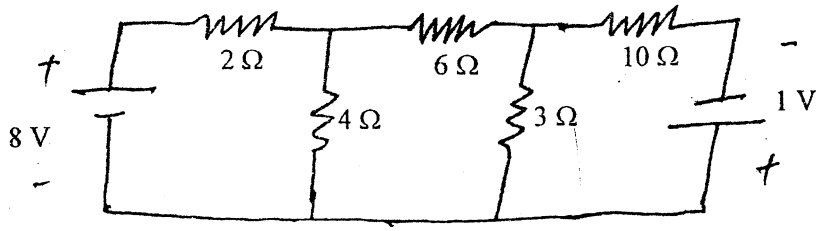
2. a) State and explain superposition theorem with an example. [4]

   b) How can a delta connected network of resistors be converted to star connection? Explain with necessary circuits and equations. [6]

   c) Use Norton's theorem to find the current through 100 Ω resistor of the circuit below. [6]

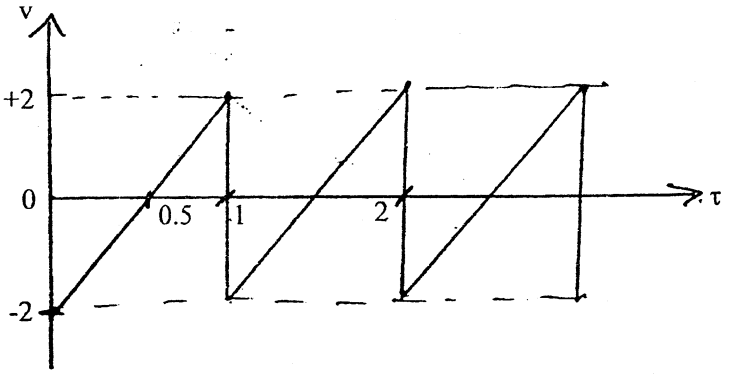


3. a) Find the voltage across the 3 Ω resistor in the following network by nodal analysis. [8]



b) Obtain the equivalent inductance when two inductors are connected in parallel both in (a) Opposition (b) Aiding nodes. [8]

4. a) Find the rms and average values of the waveform given in figure below. [4]

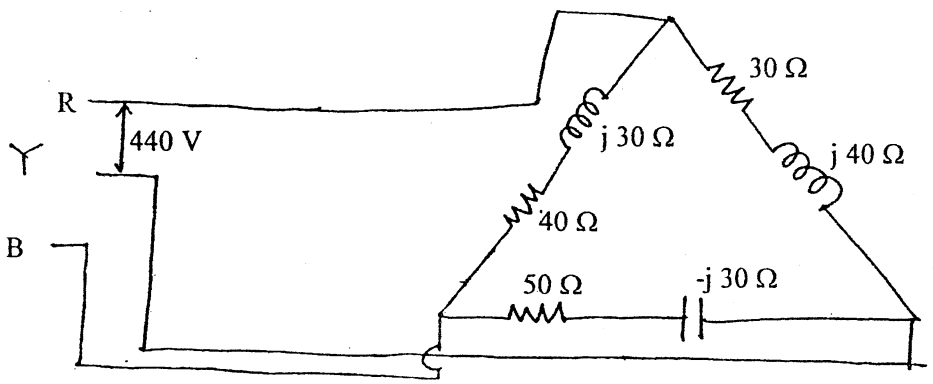


b) Define capacitance and capacitor. Explain the process of charging and discharging of capacitor with neat sketch. [4]

c) Determine the current, overall power factor, active, reactive and apparent power in each branch of the given circuit diagram. Also draw the phasor diagram. [8]

5. a) A voltage e(t)=100 sin 314 t is applied across series circuit consisting of 10 Ω resistance, 0.0318 H inductance and a capacitor of 63.6 μF. Calculate expression for i(t), phase difference between voltage and current, power factor, apparent power and active power. [8]

b) For the delta connected load, find the phase currents, line currents, power (active, reactive and apparent) in each phases. Also determine the total active power consumed. [8]



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95 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BGE, BME	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

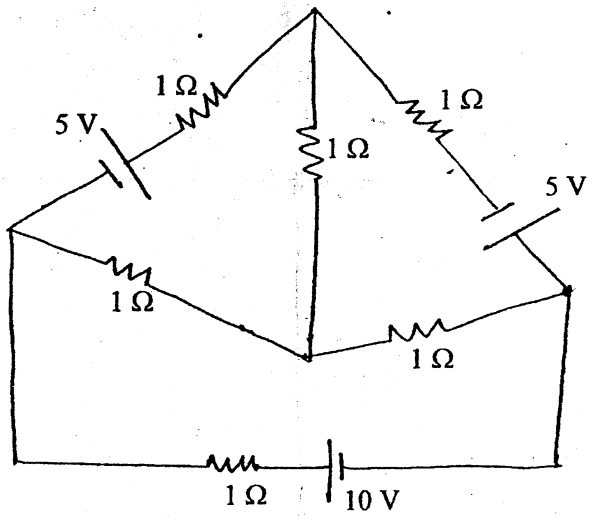
Subject: - Basic Electrical Engineering *(EE451)*

- ✓ 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 are ideal current and voltage sources and explain how do they differ from the practical ones? [4]

   b) A piece of resistance wire, 15.6 m long of cross-sectional area 12 mm^2 at a temperature of 0°C, passes a current of 7.9 A when connected to DC supply at 240 V. Calculate (i) resistivity of the wire (ii) the current when the temperature rises to 55°C. The temperature coefficient of the wire is 0.000 29 Ω/C° [6]

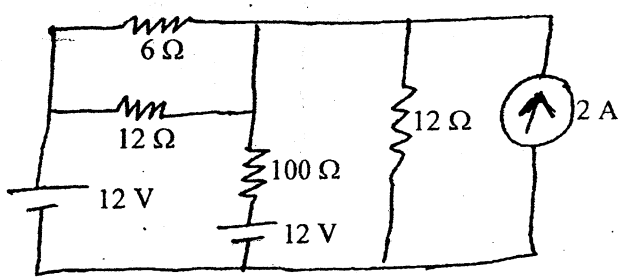
   c) Find the current flowing from the 10 V source using KVL. [6]



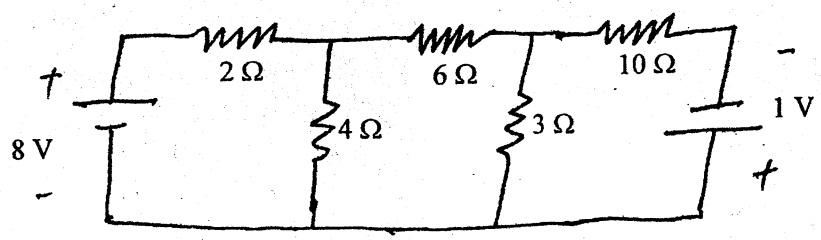
2. a) State and explain superposition theorem with an example. [4]

   b) How can a delta connected network of resistors be converted to star connection? Explain with necessary circuits and equations. [6]

   c) Use Norton's theorem to find the current through 100 Ω resistor of the circuit below. [6]

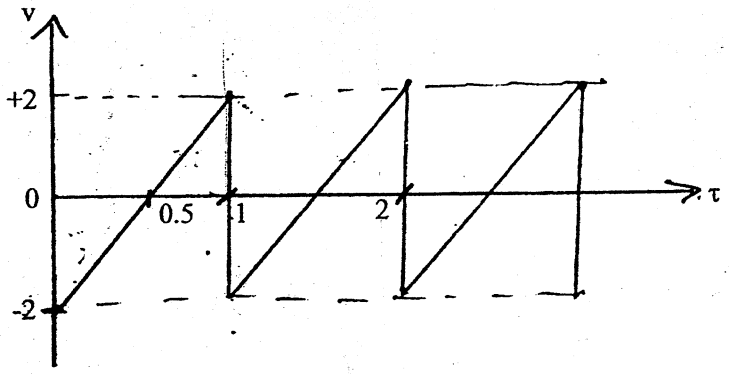


3. a) Find the voltage across the 3 Ω resistor in the following network by nodal analysis. [8]



b) Obtain the equivalent inductance when two inductors are connected in parallel both in (a) Opposition (b) Aiding nodes. [8]

4. a) Find the rms and average values of the waveform given in figure below. [4]

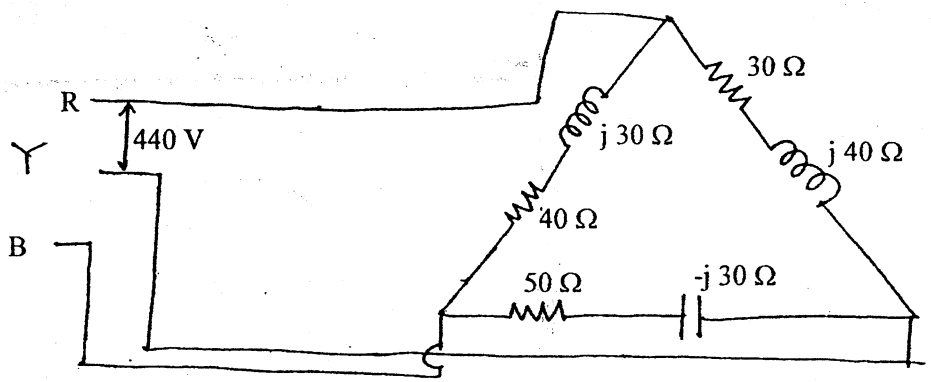


b) Define capacitance and capacitor. Explain the process of charging and discharging of capacitor with neat sketch. [4]

c) Determine the current, overall power factor, active, reactive and apparent power in each branch of the given circuit diagram. Also draw the phasor diagram. [8]

5. a) A voltage e(t)=100 sin 314 t is applied across series circuit consisting of 10 Ω resistance, 0.0318 H inductance and a capacitor of 63.6 μF. Calculate expression for i(t), phase difference between voltage and current, power factor, apparent power and active power. [8]

b) For the delta connected load, find the phase currents, line currents, power (active, reactive and apparent) in each phases. Also determine the total active power consumed. [8]



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05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Bhadra

Exam.	Regular (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BME	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

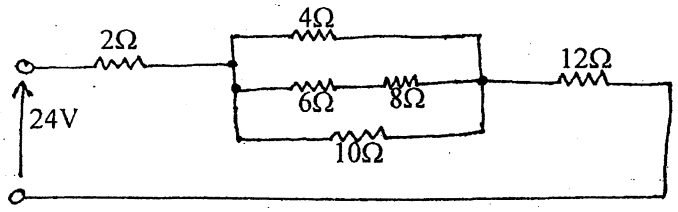
Subject: - Basic Electrical Engineering *(EE451)*

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

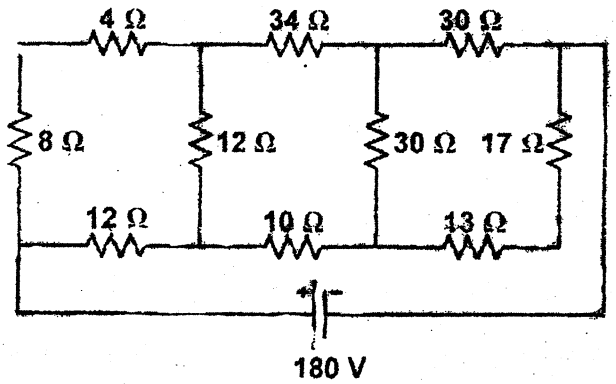
1. a) What do you mean by ideal and practical voltage source? Explain the effect of an internal resistance of a voltage source on its terminal characteristic. [4]

   b) A 230V metal filament lamp has its filament 50cm long with cross-sectional area of 3×10^{-6} cm^2. Specific resistance of the filament metal at 20°C is $4\times10^{-6}\Omega$cm. If the working temperature of the filament is 2000°C, find the wattage of the lamp. Temperature coefficient of resistance of the filament material at 20°C is 0.0055 per degree centrigrade. [6]

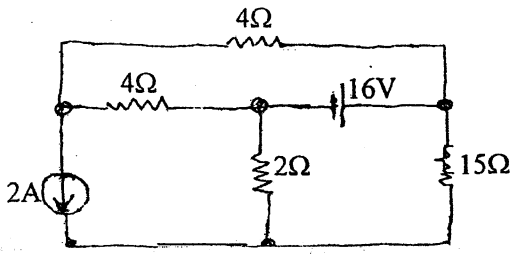
   c) Find the equivalent resistance in the figure below, and power dissipated in the 10Ω resistor. [6]



2. a) Determine the value of current in 10 Ohm resistor in the network shown in figure below using Star/Delta conversions. [6]

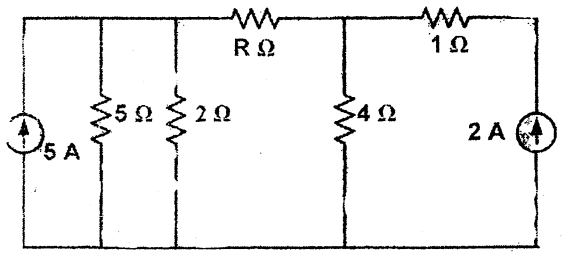


   b) Use Thevenin's theorem to find the current flowing through 15Ω resistor of the network of figure below. [6]

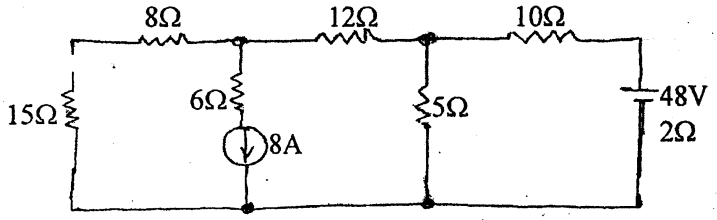


c) State Norton's theorem and list the steps for Nortonizing a circuit. [4]

3. a) Find the value of R such that maximum power transfer takes place from the current sources to the load R in figure below. Obtain the amount of power transfer. [8]



b) Use mesh current method to calculate the current through the 15Ω resistor in the figure shown below. [8]



4. a) Two capacitors, A and B are connected in series across a 200V d.c. supply. The p.d. across A is 120V. This p.d. is increased to 140V, when a 3μF capacitor is connected in parallel with B. Calculate the capacitances of A and B. [4]

b) Describe phasor representation and addition of two sinusoids $i_3 = i_1 + i_2$. Illustrate: [6]

i) Position of the phasors for t = 0
ii) Sinusoidal waveform for increasing time.

c) In a certain circuit, supplied from 50Hz mains, the potential difference has a maximum of 500V, and the current has a maximum value of 10A. At t = 0, the instantaneous values of p.d., and current are 400V, and 4A respectively, both increasing positively. Assuming sinusoidal variation, obtain the expression for p.d., and current. Calculate the instantaneous values of the same at t = 0.015s, and find the phase difference between them. [6]

5. a) Three impedances of (100 + j0)Ω, (100 – j40)Ω and (100 + j60)Ω are connected in star to a 3-phase, 4 wire system for which the phase voltage is 100V and its frequency is 60Hz. Calculate the three line currents, active, reactive and apparent power per phase. Also find the current through the neutral wire. [8]

b) A voltage of 200∠53.8 is applied across two impedances in parallel. The values of impedances are (12 + j16) Ohm and (10 – j20) Ohm. Determine: (i) Total impedance (ii) total current drawn from the circuit (iii) Current flowing through each parallel branch (iv) Power factor of the whole circuit (v) Active, reactive and apparent power. Draw the phasor diagram. [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.

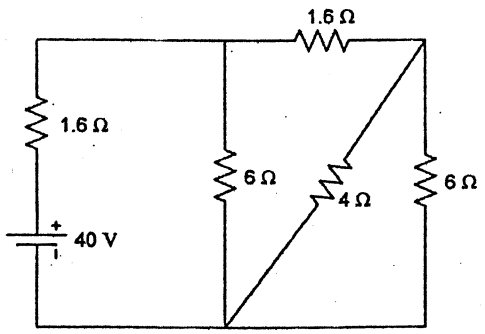
Subject: - Basic Electrical Engineering

- ✓ 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.*

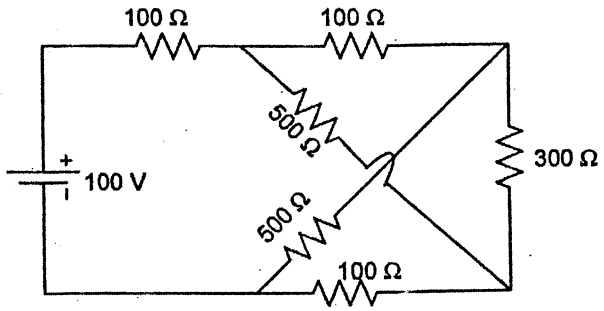
1. a) What do you mean by ideal and practical voltage source? Explain the effect of an internal resistance of a voltage source on its terminal characteristics. [2+3]

   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]

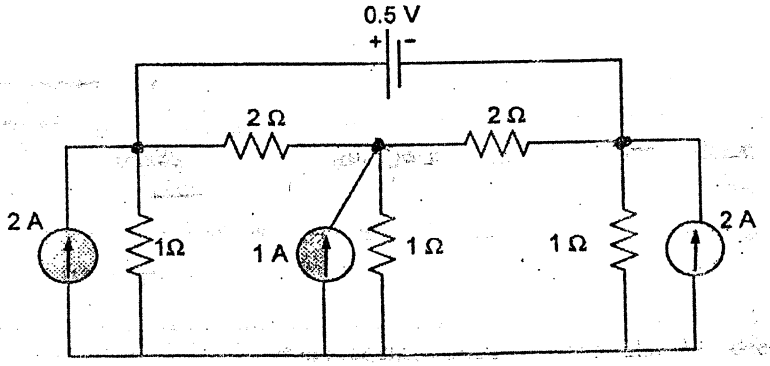
   c) Find the current through 4Ω resistance. [5]



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

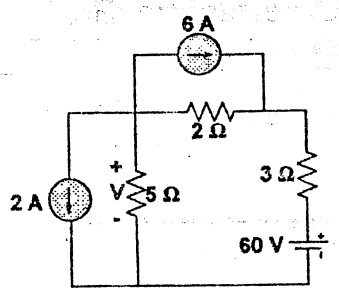


   b) Obtain the voltages at each nodes by applying nodal voltage analysis. [6]

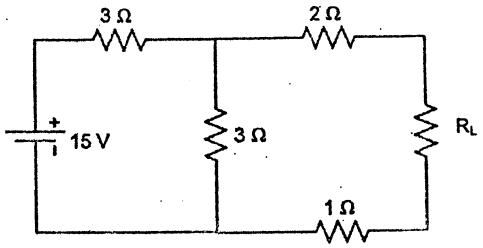


   c) State and explain Norton's theorem with an appropriate example. [4]

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

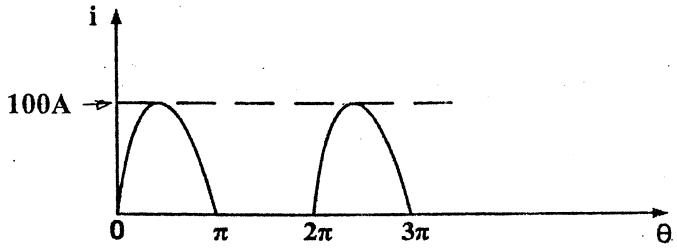


b) Find the value of R_L such that maximum power will be transferred to R_L. Find the value of the maximum power. [8]



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)Ω. 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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15 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2067 Mangsir

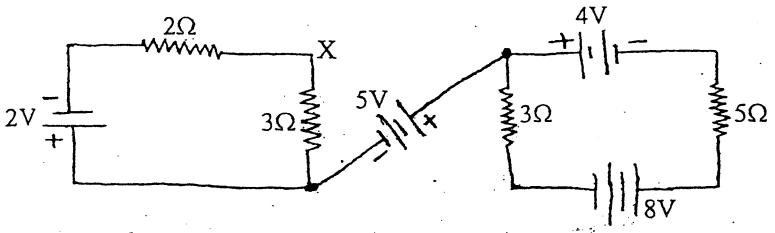
Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCE, BME	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

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 understand by an ideal current source? How can it be made a practical current sources and why should we do that? [6]

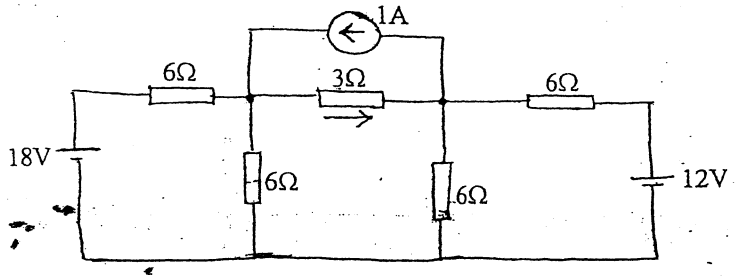
   b) What is the difference of potential between X and Y in the network shown in figure below. [5]



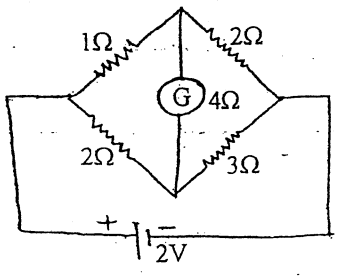
   c) A coil is connected across a constant dc source of 120V. It draws a current of 12 Amp at room temperature of 25°C. After 5 hours of operation, its temperature rises to 65°C and current reduces to 8 Amp. Calculate: [5]

   i) Current when its temperature has increased to 80°C
   ii) Temperature coefficient of resistance at 30°C

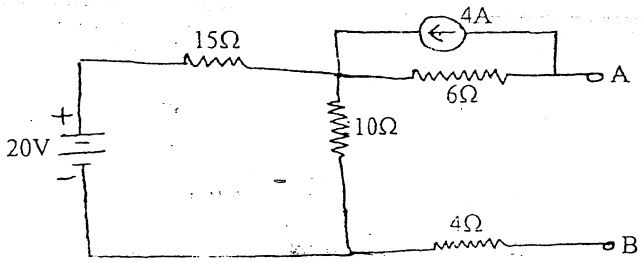
2. a) Find the current I in the circuit of figure given below by applying nodal voltage analysis. [6]



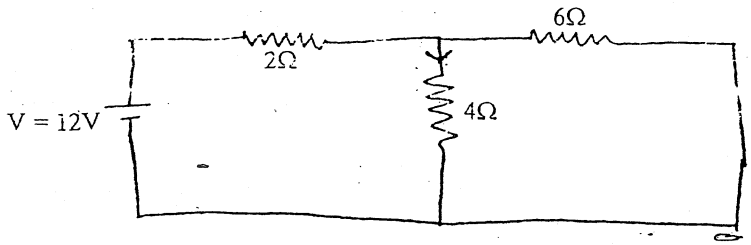
   b) Calculate the current through the galvanometer in the bridge circuit as shown in figure given below using Kirchhoff's laws. [6]



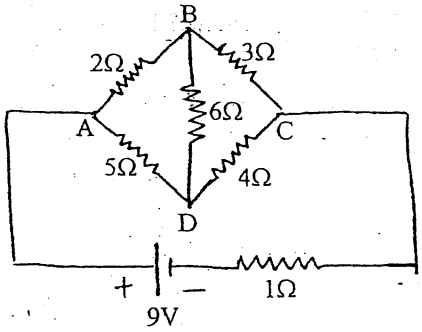
   c) State Thevenin's theorem and find the Thevenin's equivalent circuit for terminal pair AB of the network shown in figure given below. [4]



3. a) State reciprocity theorem. Verify the theorem in the network given below. [4]



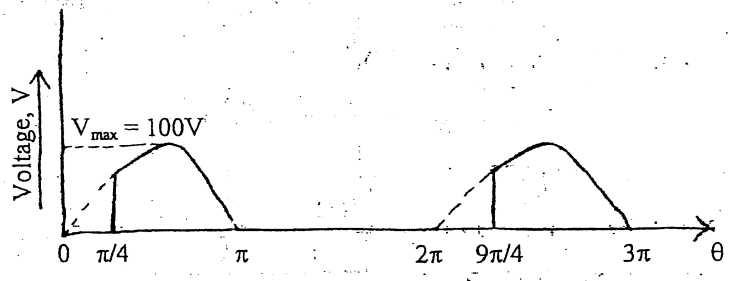
b) Calculate the current in the 6Ω resistor in the network shown below using Norton's theorem. [8]



c) Why do we express an ac voltage or current by its RMS value? Discuss. [4]

4. a) In a purely inductive circuit when excited by a sinusoidal voltage, show mathematically and graphically, that the current lags the applied voltage by 90° and also show that the average power consumed in the inductor is zero. [6]

b) Determine the average and r.m.s. values of voltage for sinusoidal voltage waveform as shown in figure below. [6]



c) Explain with diagrams what do you understand by [4]

i) In phase
ii) Lagging and
iii) Leading quantities applied to sinusoidal ac system.

5. a) An emf, $e_0 = 141.4 \sin (377t + 30°)$ is impressed on the impedance coil having a resistance of 4Ω and an inductive reactance of 1.25Ω measured at 25Hz. What is the equation of the current? Also find the equation for the resistive drop e_R and inductive drop e_L. [6]

b) Define power factor. Explain the requirement and the method of its correction. [6]

c) List out the advantages of 3-ϕ system over single phase system. [4]

6. a) A balanced star connected load with impedance (10+j5)Ω per phase is fed from a balanced 3 phase 400-volt supply. Calculate: [8]

i) The phase voltages
ii) The line currents
iii) The power absorbed and
iv) Draw the phasor diagram

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 is purely resistive? [8]

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2067 Ashadh

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.

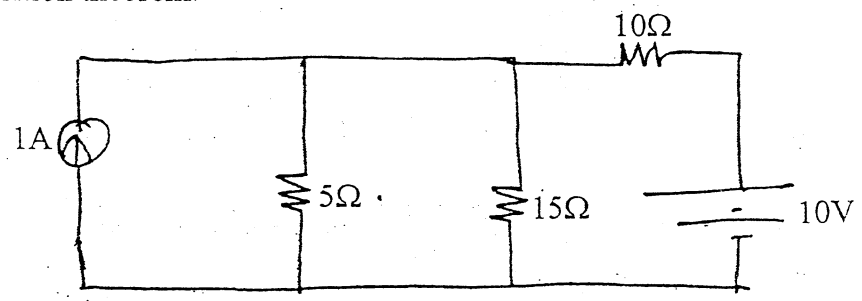
Subject: - Basic Electrical Engineering

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

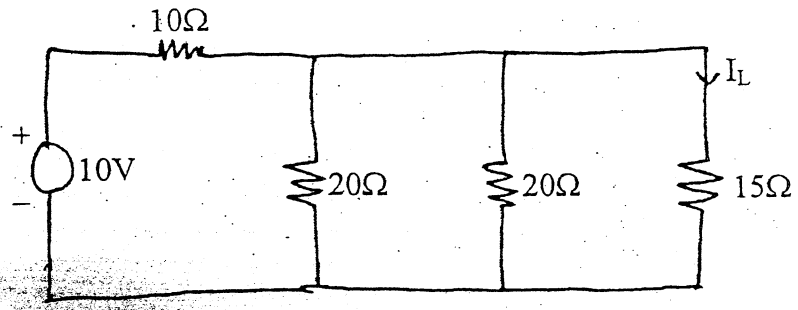
1. a) The temperature rise of the machine field winding was determined by the measurement of the winding resistance. At 20°C the field resistance was 150 ohm. After running the m/c for 6 hours at full load, the resistance was found to be 175 ohm. If the temperature coefficients of resistance of the copper winding is 1.57×10^{-5}/°C at 0°C, determine the temperature rise of the machine.

   b) What are ideal and practical voltage and current sources? Explain.

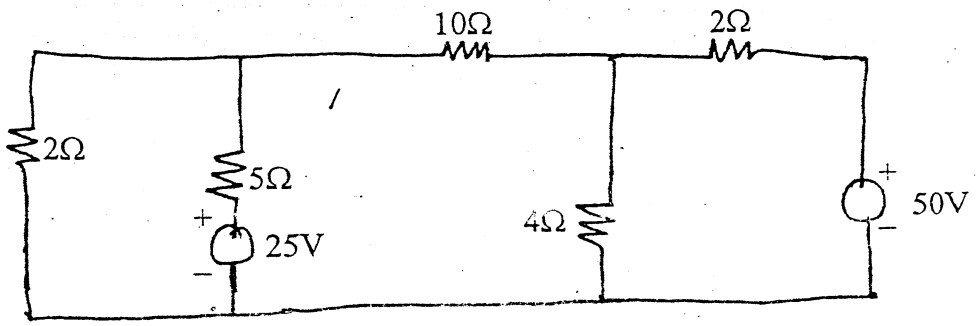
2. a) Calculate the current in the 15Ω resistor in the network shown in figure below using superposition theorem.



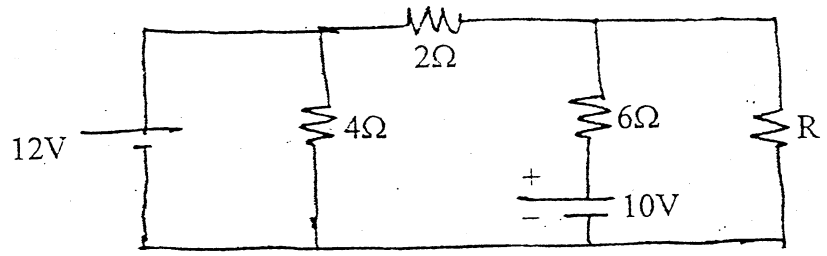
   b) Determine the current I_L through 15Ω resistor in the network by Norton's theorem.



3. a) Use nodal method to find the current through 10Ω resistor for circuit shown below.



b) Calculate the value of R to receive maximum power and the maximum power received by it for the circuit shown below.

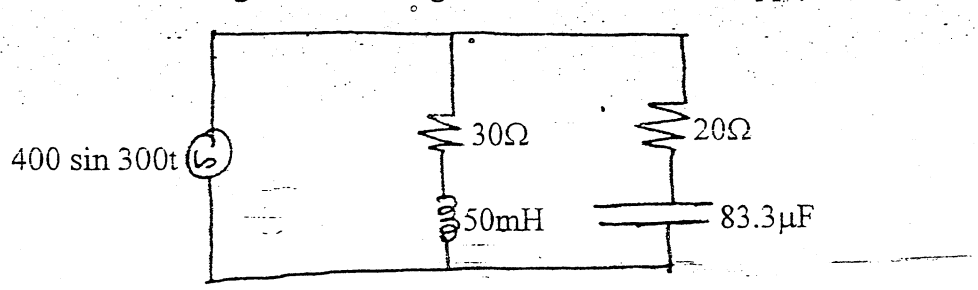


4. a) A series circuit consists of a resistance equal to 4Ω and inductance of 0.01H. The applied voltage is v = 283 sin (300t + 90°) volts. Find

   i) The power dissipated in the circuit
   ii) The expression for i(t)
   iii) Power factor and
   iv) Draw a phasor diagram

   b) For the circuit below, calculate

   i) Magnitude and phase angles of current in each of the branches,
   ii) Active, reactive and apparent power and power factor of the circuit, and
   iii) Draw the vector diagram indicating branch currents and supply voltage



5. a) Describe the advantages of three phase AC system over single-phase AC system.

   b) Three phase balanced load consists of three similar coils, each of resistance 50Ω and inductance of 0.3H. The supply voltage is 415V, 50Hz. Calculate (i) The line current (ii) The power factor (iii) Total power consumed and (iv) Draw the phasor diagram. Take R×B as phase sequence.

6. a) Define power factor and explain the disadvantages and causes of low power factor?

   b) A single-phase 50Hz motor takes 20A at 0.65 power factor lagging from a 230V sinusoidal supply. Calculate the KVar rating and capacitance to be connected in parallel to raise the power factor to 0.9 lagging. What is the new supply current?

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