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

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

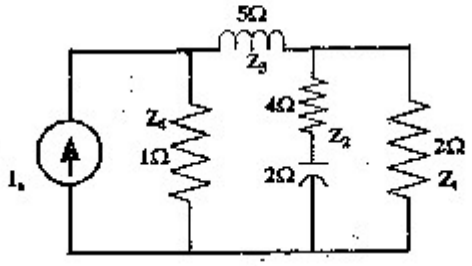
ii) Total capacitance and

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

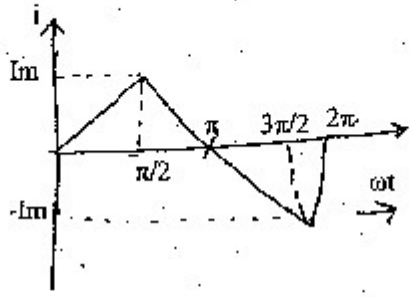
c) State Maximum Power Transfer Theorem and also prove "maximum power will be dissipated when $R_{Internal} = R_L$" [6]

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

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



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



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

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

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

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

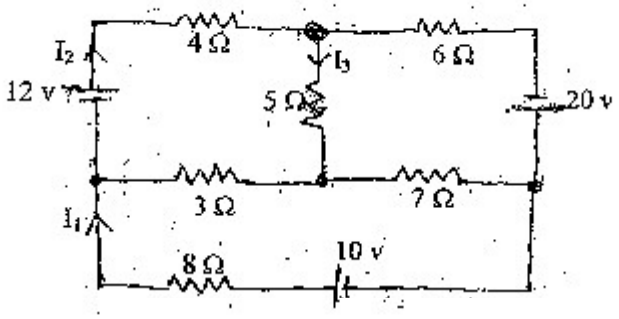
Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE, B.Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE401)*

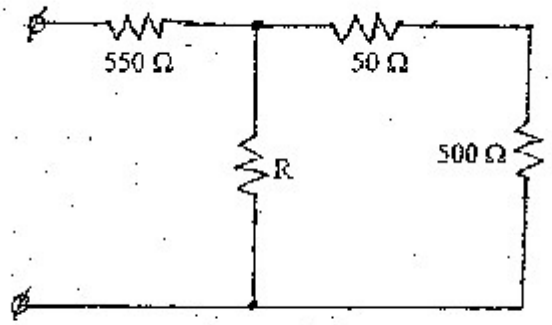
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any Five questions.*
- ✓ *All questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

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

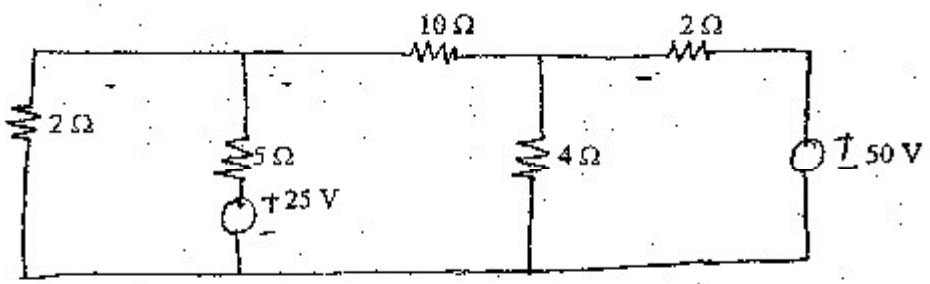
   b) Find I_1, I_2 and I_3 in the circuit shown in the figure using Kirchh-off's law. [6]



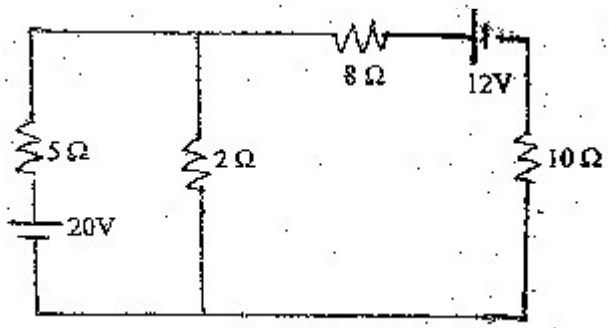
   c) What is the value of the unknown resistor 'R' in figure below, if the voltage drop across 500Ω resistor is 2.5 volts? [6]



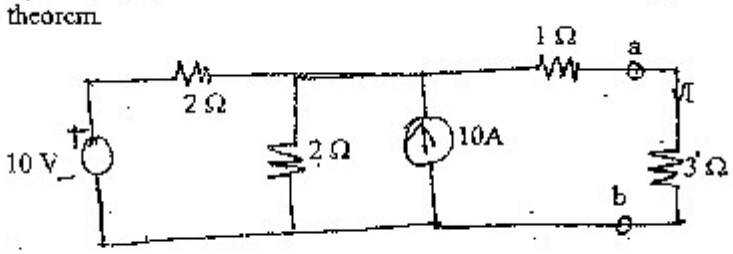
2. a) Use the node voltage method (nodal) to find the current flowing through 10Ω resistor in the network shown figure below. [8]



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



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



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

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

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

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

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

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

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

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

Subject: - Basic Electrical Engineering *(EE401)*

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

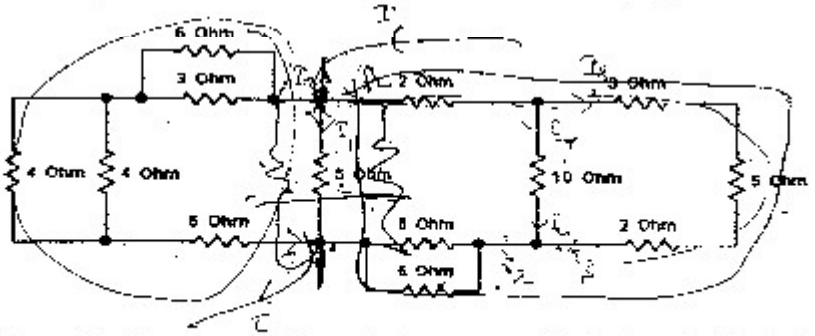
1. a) What is the factor responsible for the deviation of the practical sources from their ideal behavior? Explain the effect of this factor on the terminal characteristics of the voltage source. [6]

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

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

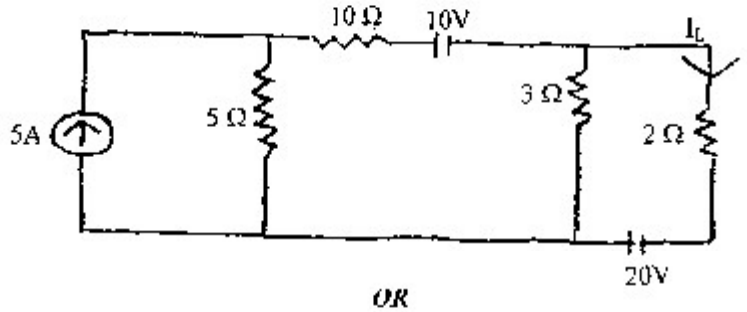
2. a) Explain with neat diagram and write the equations for Delta- Star Conversion and for Star-Delta Conversion. [4]

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



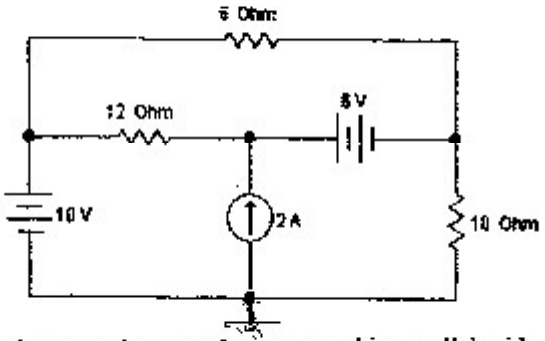
   c) "Thevenin's theorem and Norton's theorem are dual of each other". Justify the statement with suitable example. [6]

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



OR

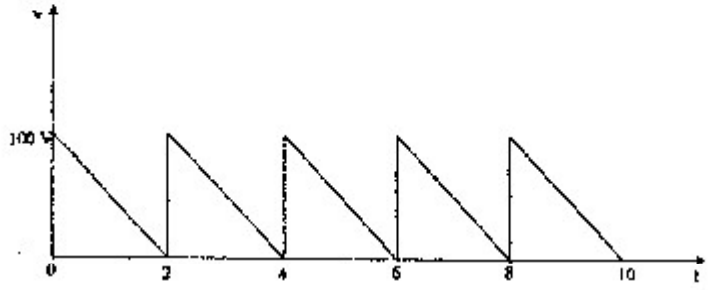
Find the current passing through 10 Ω resistor using loop current method.



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

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

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



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

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

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

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

25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

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

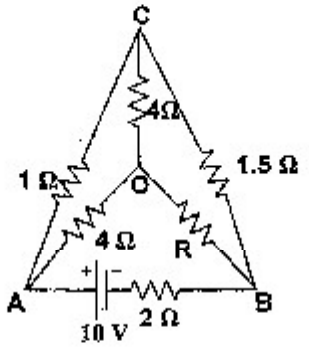
Subject: - Basic Electrical Engineering *(EE401)*

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

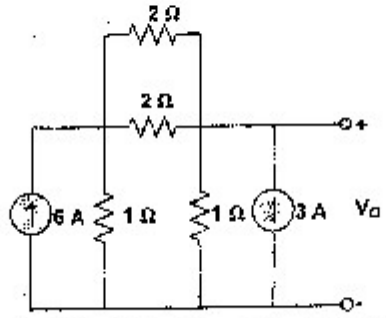
1. a) What do you understand by terms 'resistance' and 'resistivity'? On what factors the resistance offered by a conductor depends? [4]

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

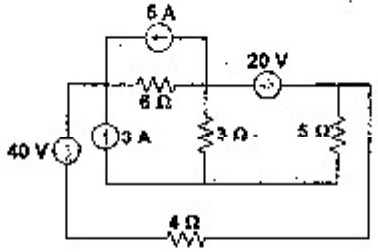
   c) Calculate the value of unknown resistance R in the circuit shown below and the current flowing through it when the current in the branch OC is zero. [6]



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

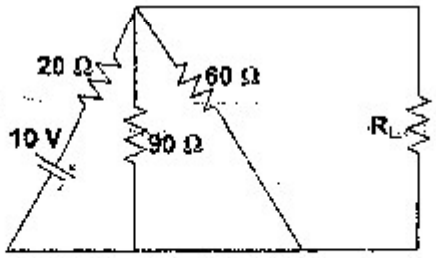


   b) Determine the power dissipated by 5Ω resistor in the circuit shown in figure below by applying nodal voltage analysis. [6]

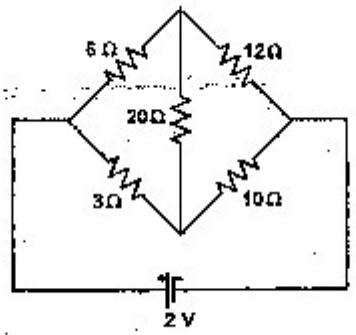


   c) State and explain superposition Theorem with an appropriate example. [5]

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



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



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

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

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

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

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

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

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

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

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25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

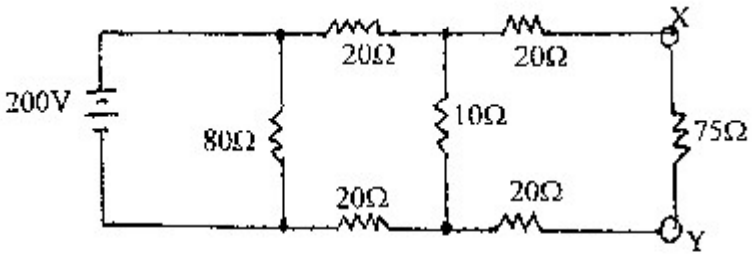
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE, B.Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE401)*

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

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

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



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

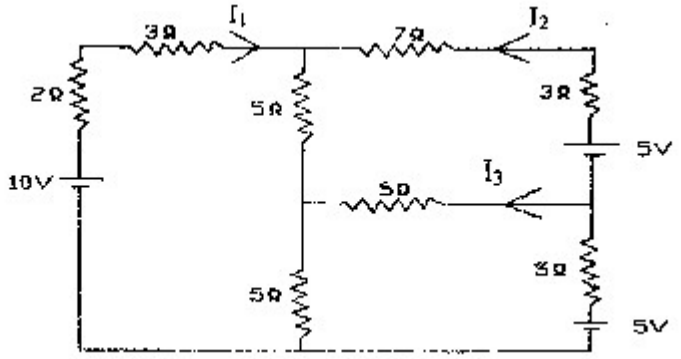
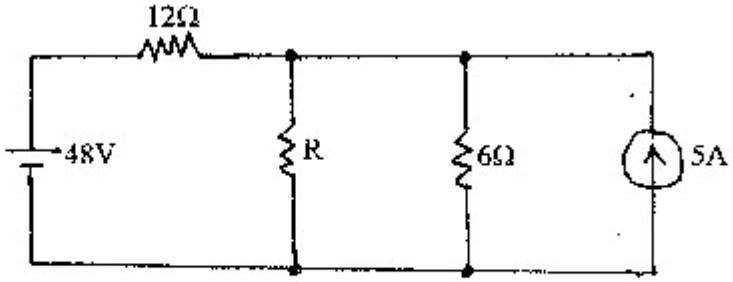


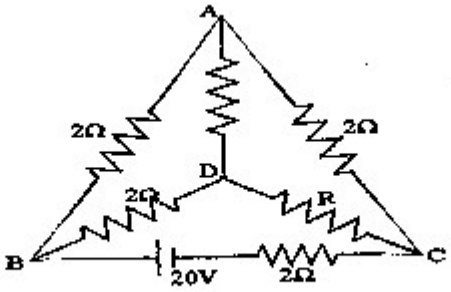
Fig: 1.2

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

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



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



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

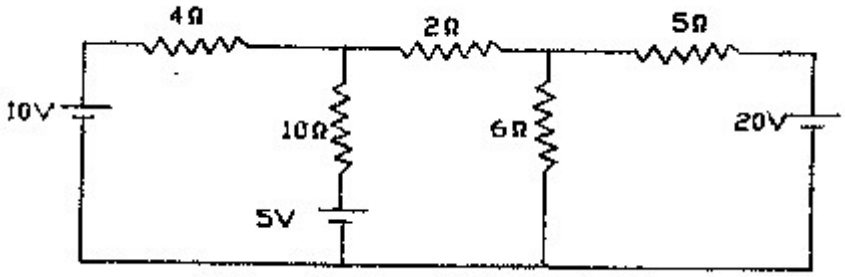
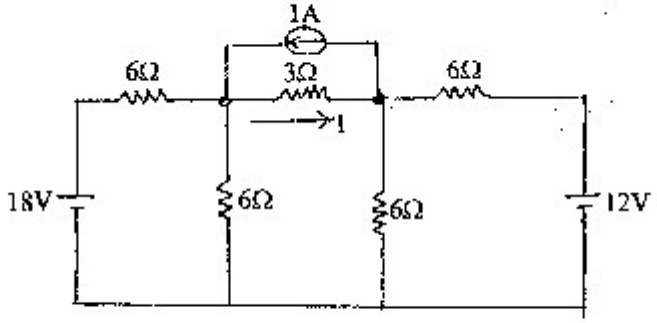


Fig: 3.1

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



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

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

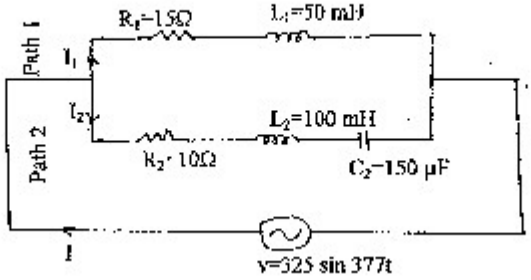
c) Define inductance and derive relation for connection of inductors connected in parallel connection. [4]

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

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

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

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



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

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

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

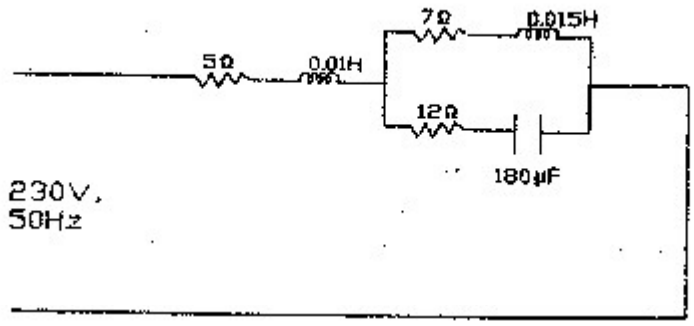


Fig: 5.1

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

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-25 TRIBHUVAN UNIVERSITY
INSTITUTE OF SCIENCE AND TECHNOLOGY
Examination Control Division
2068 Baishakh

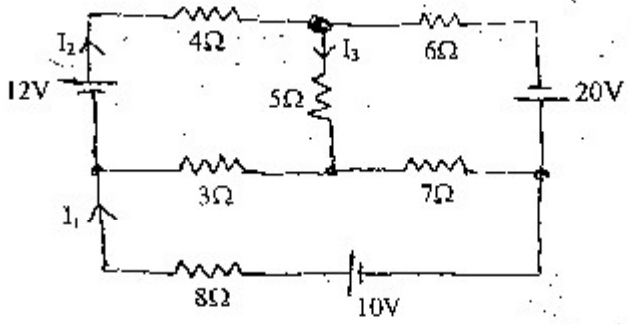
Exam.	Regular, Back		
Level			
Programme	BEL, BEX, BCT, BIF, B.Agri	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Basic Electrical Engineering

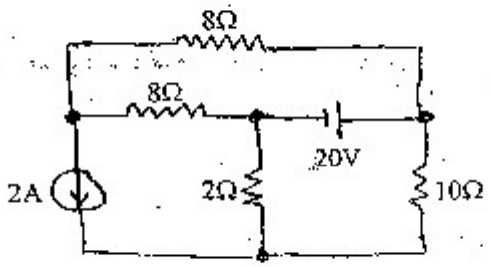
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Five** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

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

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

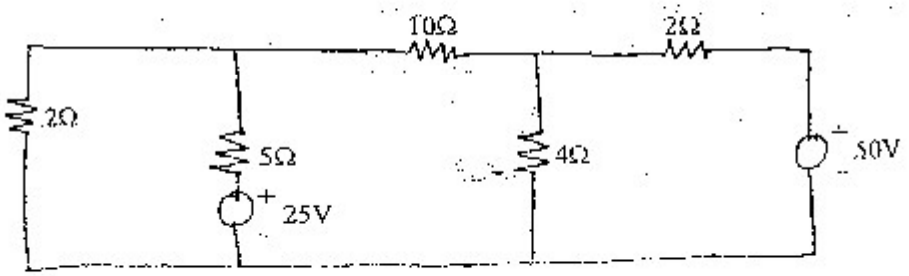


2. a) Use Superposition theorem to find the current flowing through the 10Ω resistor shown in the figure. [8]

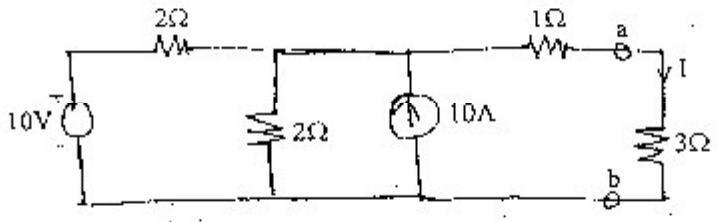


   b) State Thevenin's theorem and give the procedure for Thevenizing a circuit. Explain the major advantages offered by use of this theorem. [8]

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



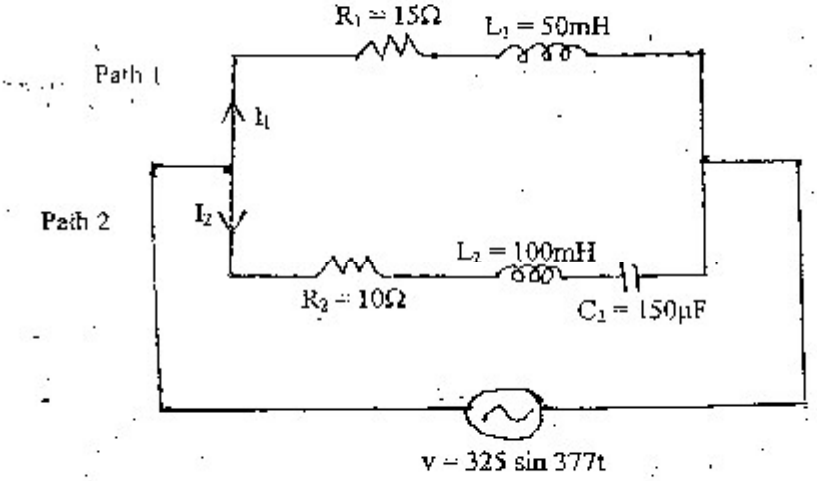
b) Determine the power dissipated in 3Ω resistor in the circuit shown below using Norton's theorem. [8]



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

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

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



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

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

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

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

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

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2068 Chaitra

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

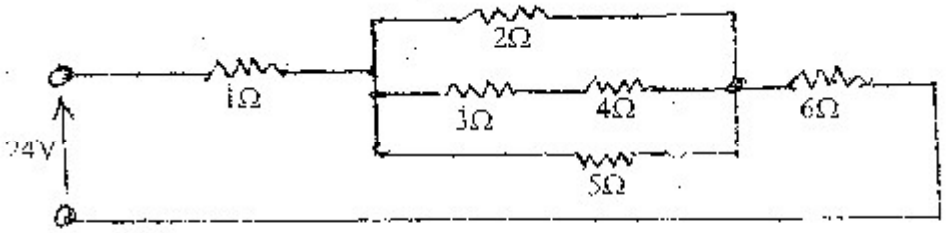
Subject: - Basic Electrical Engineering *(EE 401)*

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

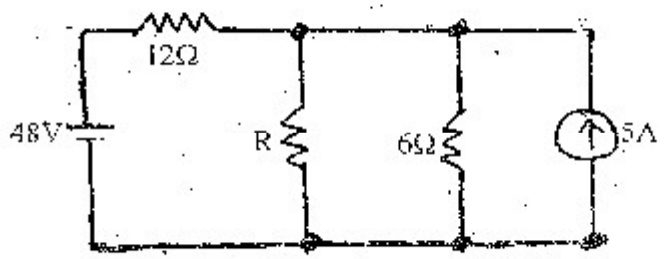
1. a) Explain emf, potential difference and current with a circuit diagram. [4]

   b) The temperature rise of the machine field winding was determined by the measurement of the winding resistance at 20°C the field winding resistance was 160 Ohm(Ω). After running the machine for some hours at full load the resistance is 185 Ω. If the temperature coefficient of resistance of the copper winding is 4.3×10^{-3}/°C at 0°C. Determine the temperature rise of the machine. [6]

   c) Find the equivalent resistance in the figure shown, and power dissipated in the 5Ω resistor. [6]



2. a) Calculate the value of R that will absorb maximum power from the circuit (shown in the figure). Also calculate the maximum power drawn by it. [6]



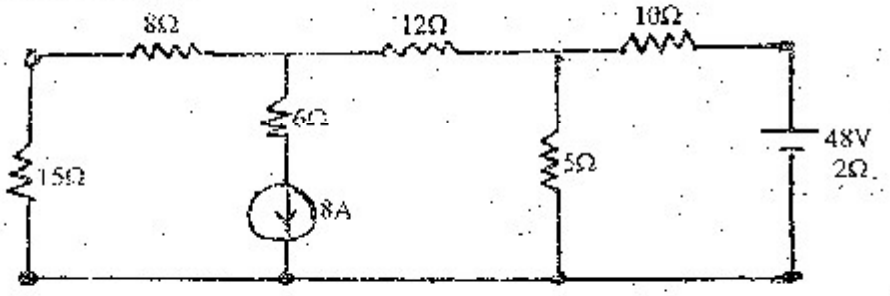
   b) State Norton's description theorem and list the steps for Nortonizing a circuit. Compare the Norton's equivalent circuit to the Thevenin's equivalent circuit. [6]

   c) What is the total cost of using the following at Rs 7 per kilowatt hour? [4]

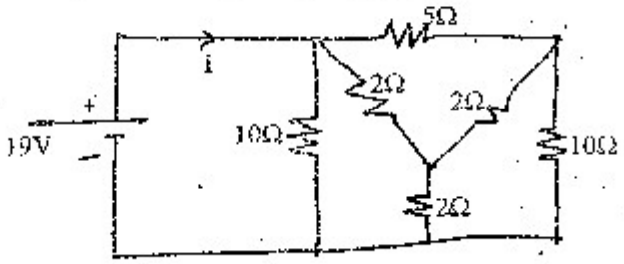
      i) A 1200 W toaster for 30 min
      ii) Six 50 W bulbs for 4 hours

iii) A 400 W washing machine for 45 min.
iv) A 4800 W electric cloths dryer for 20 min.

3. a) Use Nodal analysis method to calculate the current through the 15Ω resistor in the figure shown below. [8]

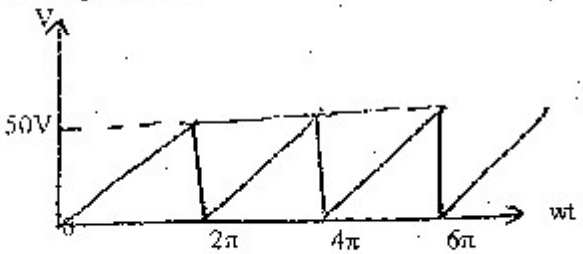


b) Find the current I as shown in figure below using star - delta transformation. [4]



c) An air cored coil is 2.5cm long and has an average cross-sectional area of $2cm^2$. Determine the number of turns if the coil has an inductance of 100 μH. [4]

4. a) Calculate the average value, rms value, form factor and peak factor of the saw tooth wave as shown in figure below. [6]



b) What do you mean by reactive power in AC circuit? Explain it by constructing phasor diagram for real power, reactive power and apparent power. [5]

c) Describe and illustrate the phasor relationship that exist between the voltage that appears across the terminals of a pure capacitor and the current that flows through it in steady state when the capacitor is excited by a sinusoidal source. [5]

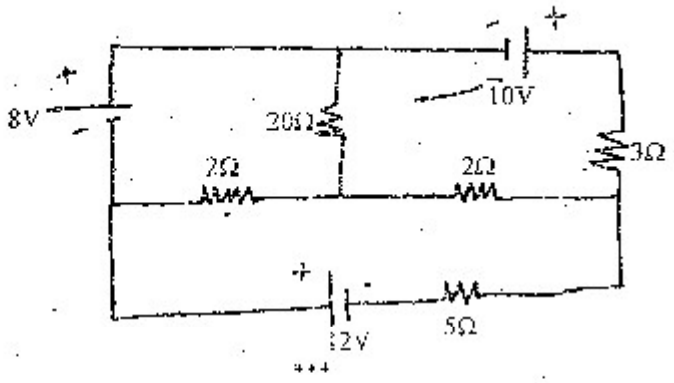
5. a) A voltage of $200\angle 0°$ V is applied across impedances in parallel. The value of impedances are $(12 + j16)\Omega$ and $(10-j20)\Omega$. Determine the KW, KVA and KVAR in each branch and the power factor of the whole circuit. [8]

b) A delta connected load of $Z_{AB} = 52\angle 45°\Omega$, $Z_{BC} = 52\angle -30°\Omega$ and $Z_{CA} = 10\angle 0°\Omega$ are connected to a 380V, 3 phase ac source. Find the magnitude of the line currents and total power absorbed by loads, when phase sequence is ABC. [8]

6. a) A single phase motor takes a current of 40A at pf 0.7 lagging from a 440V, 50HZ supply. What value must a shunting capacitor have to raise the power factor to 0.9 lagging. [6]

b) What are the advantages of three phase AC system over signal phase ac system? [4]

c) Determine current in 5Ω resistor by mesh analysis in figure below. [6]



[8]

[4]

[4]

[6]

[5]

[5]

[8]

[8]

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2067 Ashadh

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

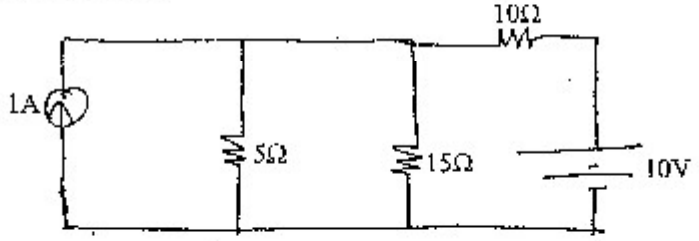
Subject: - Basic Electrical Engineering

- ✓ 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.*

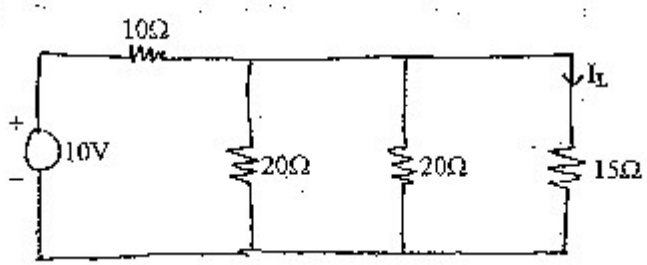
1. a) The temperature rise of the machine field winding was determined by the measurement of the winding resistance. At 20°C the field resistance was 150 ohm. After running the m/c for 6 hours at full load, the resistance was found to be 175 ohm. If the temperature coefficients of resistance of the copper winding is 1.57×10^{-3}/°C at 0°C, determine the temperature rise of the machine.

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

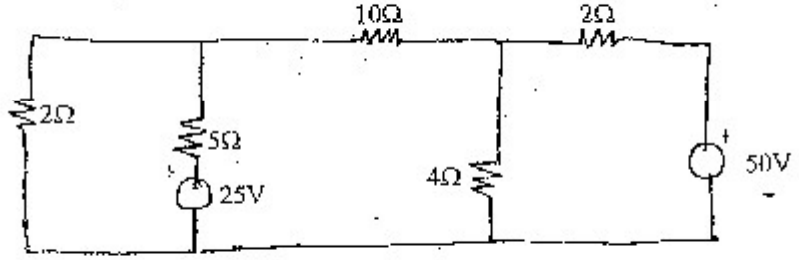
2. a) Calculate the current in the 15Ω resistor in the network shown in figure below using superposition theorem.



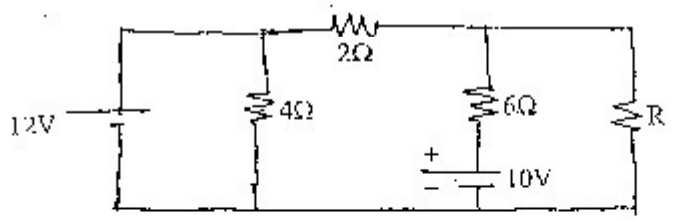
   b) Determine the current I_L through 15Ω resistor in the network by Norton's theorem.



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.

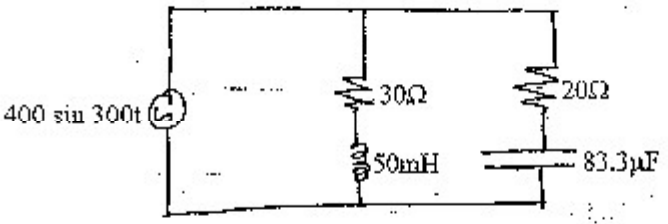


4. a) A series circuit consists of a resistance equal to 4Ω and inductance of 0.01H. The applied voltage is v = 283 sin (300t + 90°) volts. Find

   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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