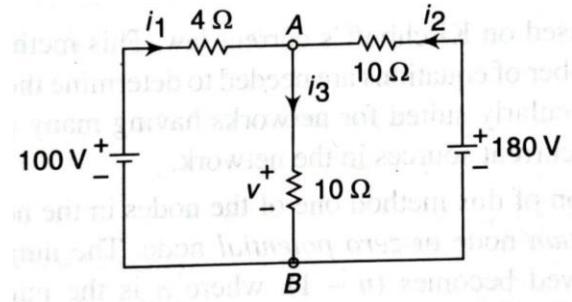


Practice Set for Basis Electrical

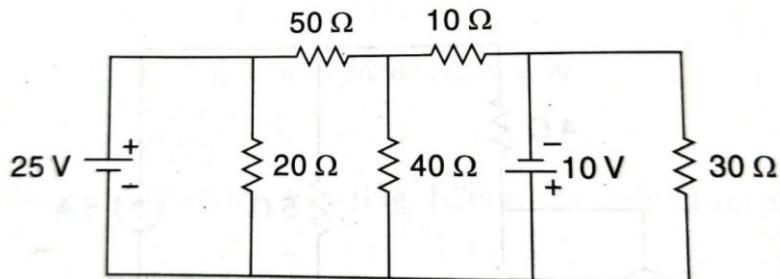
Short Questions (5 Marks)

1. State superposition theorem. Mention its limitations

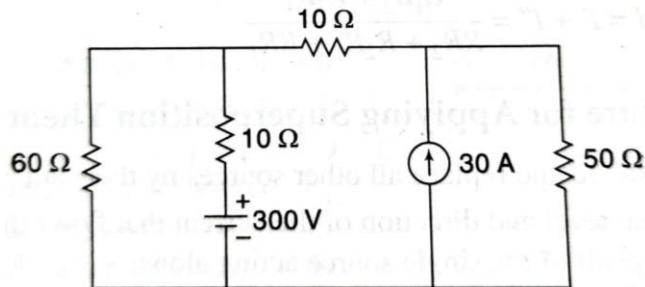
2. Find the voltage v in the circuit shown in figure



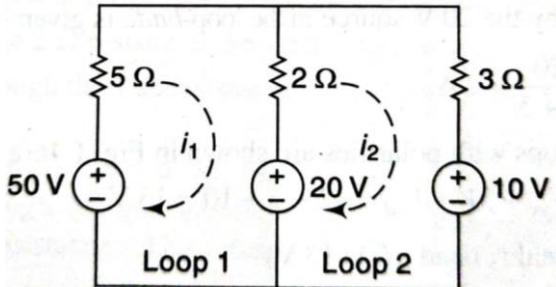
3. Find the current in the $40\ \Omega$ resistor using Superposition theorem.



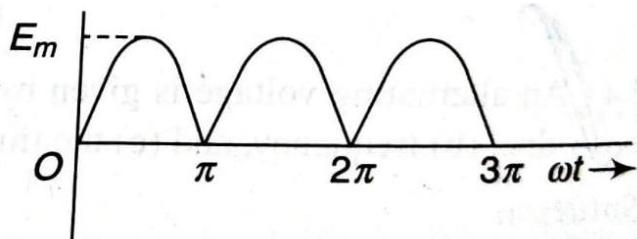
4. Find the current in the $50\ \Omega$ resistor using Superposition theorem



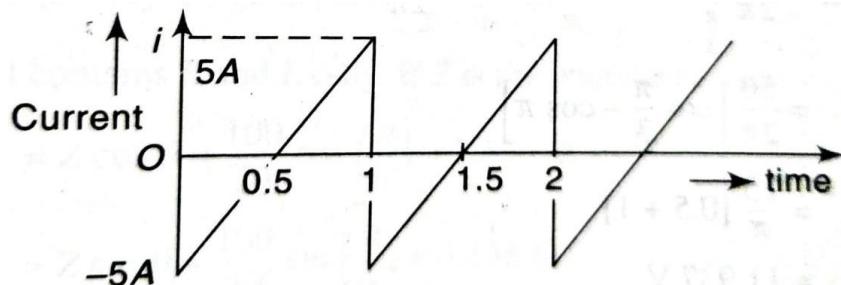
5. Using Mesh analysis find the current flowing through the $50\ \text{V}$ source



6. Find the rms and average value of the waveform shown below:



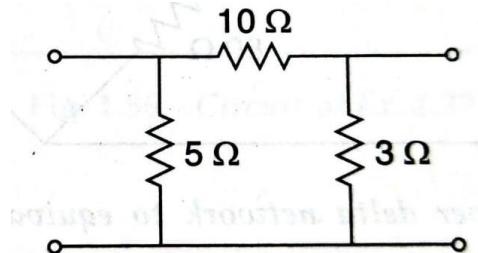
7. Find the rms and average value of the waveform shown below:



8. An alternating voltage is given by the equation $v = 282.84 \sin(377t + \pi/6)$. Find the (a) rms value, (b) frequency, and (c) the time period.

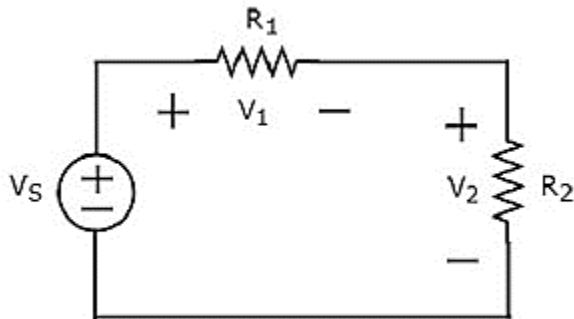
9. A 2-element series circuit consumes 700 W and has a p.f. of 0.707 leading. If the applied voltage is $v = 141 \sin(314t + 30^\circ)$ find the circuit constants.

10. Convert the π network shown into equivalent T network.

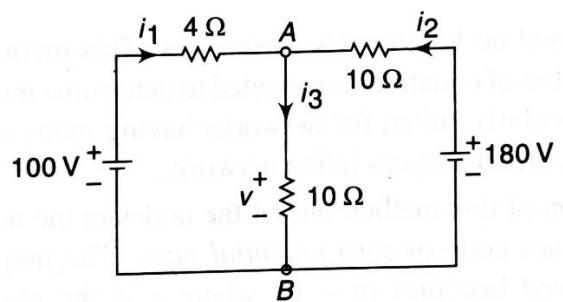


11. The load in each branch of a star connected three-phase circuit consists of $10\ \Omega$ resistance and $0.06\ H$ inductance in series. The line voltage is $430\ V$. Calculate the phase voltage and the phase current.
12. In a balanced three-phase $200\ V$ circuit, the line current is $115.5\ A$. When the power is measured by two wattmeter method one of the instruments reads $20\ kW$ and the other zero. What is the power factor of the load?
13. Three similar coils each having series resistance of $20\ \Omega$ and capacitance $100\ \mu F$ are connected in star to a 3-phase, $400\ V$, $50\ Hz$ balanced supply. Find the line current, power factor, total KVA and total kW.
14. Define a transformer. Discuss the principle of operation of a single-phase transformer.
15. Find the active and reactive components of no-load current, and the no-load current of a $440/220\ V$ single-phase transformer if the power input to the ho winding is $80\ W$. The low-voltage winding is kept open. The power factor of the no-load current is 0.3 lagging
16. Define ideal transformer. Draw and explain the no load phasor diagram of an ideal transformer.
17. The primary winding of a $50\ Hz$ transformer is supplied from a $440\ V$, $50\ Hz$ source and has 200 turns. Find the (i) peak value of flux (ii) voltage induced in the secondary winding if it has 50 turns
18. Derive the relationship between line and phase voltages in a star (Y) connected system.
19. Write down the analogy between the magnetic circuit and the electrical circuit.
20. Explain magnetic hysteresis using the B–H curve.
- 21 .Three similar coils each having series resistance of $20\ \Omega$ and capacitance $100\ \mu F$ are connected in star to a 3-phase, $400\ V$, $50\ Hz$ balanced supply. Find the line current, power factor, total KVA and total kW.
22. Explain the classification of electrical sources. Differentiate between independent and dependent sources with examples.
23. State the Superposition Theorem and explain it briefly in steps.
24. Using **Thevenin's Theorem**, determine the current through a given load resistor in a two-source circuit.
25. a) State and explain Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL) .
[3]

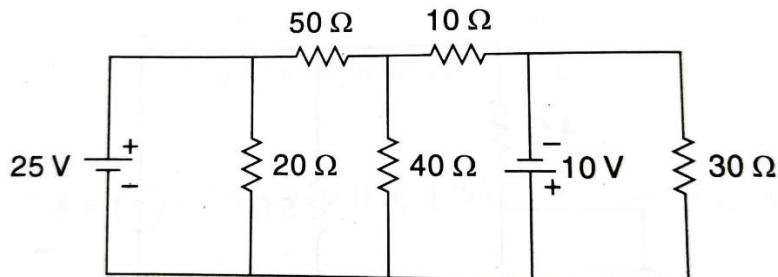
b) Write KVL equation around the loop of the following circuit. [2]



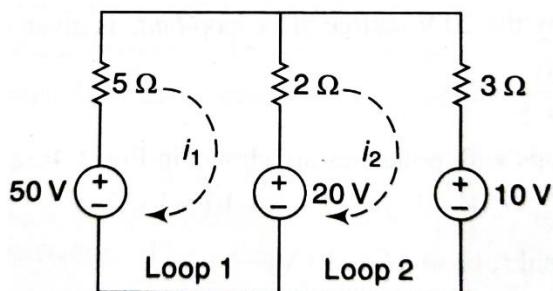
26. Find the voltage v in the circuit shown in figure



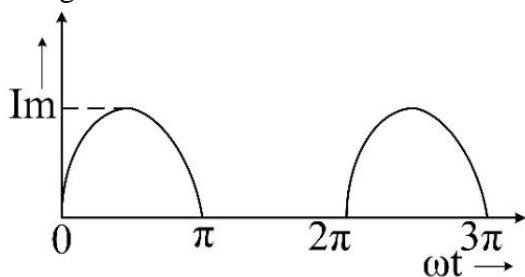
27. Find the current in the 40Ω resistor using Superposition theorem.



28. Using Mesh analysis find the current flowing through the 50 V source



29. Find the Average and the R.M.S value of the wave form shown.



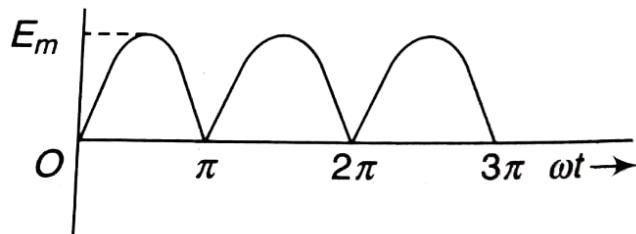
30. Draw the circuit diagram, waveform of voltage and current, phasor diagram of (i) purely resistive circuit. (ii) Purely inductive circuit. (iii) Purely capacitive circuit, supplied by sinusoidal voltage.

31. What is power factor? Define the active, reactive, and apparent power using power triangle.

32. The equation of an Alternating Current is $i=62.35\sin 323t$. Determine its (i) Maximum value (ii) Frequency (iii) RMS Value (iv) Average Value (v) Form Factor.

33. If the form factor of a current waveform is 2 and the amplitude factor is 2.5. Find the average value of the current if the maximum value of the current is 500A.

34. Find the rms and average value of the waveform shown below:



2.

35. An alternating voltage is given by the equation $v = 282.84 \sin (377t + \pi/6)$ Find the (a) rms value, (b) frequency, and (c) the time period.

36. Derive the emf equation of a single-phase transformer.

37. Define an ideal transformer. Distinguish between core type and shell type transformer.[2+3]

38 . Why is the low voltage winding placed near the core? Transformer core is made up of which material and Why is the core of a transformer laminated? [2.5+2.5]

4. What happens if a transformer is connected to a DC voltage source? Explain.

39. A 125 kVA transformer having primary voltage of 2000 V at 50 Hz has 182 primary and 40 secondary turns. Neglecting losses, calculate (a) the full-load primary and secondary currents, (b) the no-load secondary induced e.m.f. and (c) the maximum flux in the core.

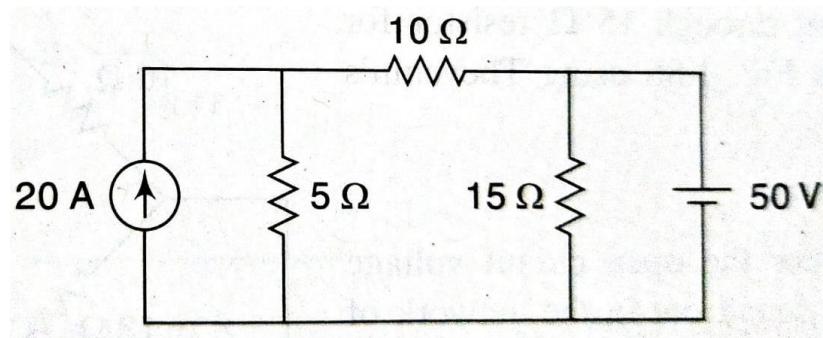
40.. Define a transformer. Discuss the principle of operation of a single-phase transformer.

41. What are the losses of the transformer? What do you mean by the efficiency of a transformer?

Each of 10 marks

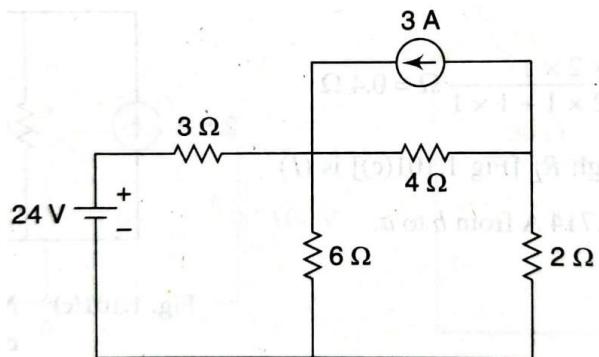
1. a) State Thevenin's theorem. What are the limitations of this theorem.

b) Find the current through $40\ \Omega$ resistor using Thevenin's theorem.



2. a) State Norton's theorem. What are the limitations of this theorem.

Find the current through $40\ \Omega$ resistor using Norton's theorem.

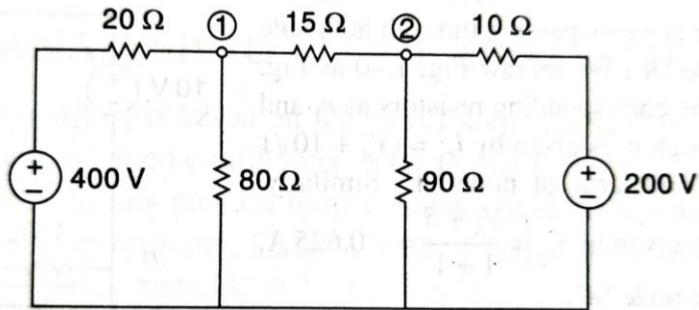


3. Distinguish between

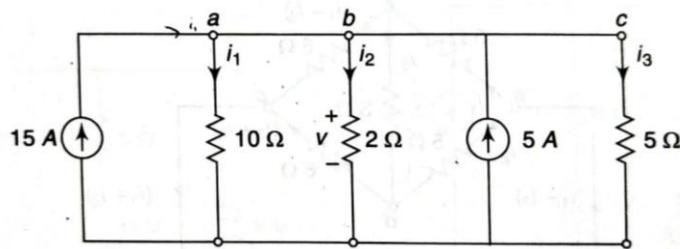
- a) Linear and nonlinear elements
- b) Active and Passive elements
- c) Unilateral and bilateral elements

4. a) State and Explain Kirchoff's voltage and current law.

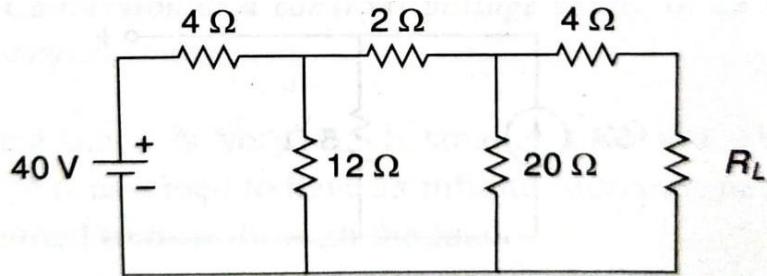
b) Find current in the $15\ \Omega$ resistor using nodal method.



5. a) In figure below, find v . Also find the magnitudes and direction of the unknown currents through 10Ω , 2Ω and 5Ω resistors.



b) Using source conversion technique find the value of voltage across R_L where $R_L=4\Omega$



1. a) A circuit containing a (a) resistance of 20Ω alone (b) inductance of 10 mH alone and (c) capacitance of $300\text{ }\mu\text{F}$ alone is connected across an alternating voltage source; write the expressions for the current when $v = 100 \sin 100\pi t$.

2. a) A 200 V , 120 W lamp is to be operated on 240 V , 50 Hz . supply. Calculate the value of the capacitor that would be placed in series with the lamp in order that it may be used at its rated voltage.

b) A resistor and a capacitor are in series with a variable inductor across a 100 V, 50 Hz supply. The maximum current obtained by varying inductance is 5 A. The voltage across capacitance is 200 V. Find the circuit elements.

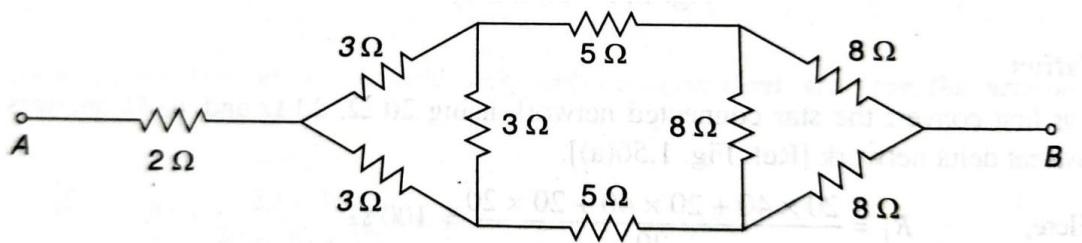
3. a) Why the p.f. if ac circuit is always positive? Discuss when the reactive power is positive or negative.

b) A 4 kW load takes a current of 20 A from a 240 V ac supply. Calculate the kVA and KVAR of the load.

4. a) A circuit consists of a coil of resistance 100 ohm and inductance 1 H in series with a capacitor of capacitance 1 μ F. Calculate (a) the resonant frequency, (b) current at resonant frequency and (c) voltage across each element when the supply voltage is 50 V.

b) A resistor and a capacitor are connected in series across a 150 V AC 40 Hz supply. The current in the circuit is measured as 5 A. If the frequency of the supply be raised to 50 Hz. the current becomes 6 A. Find the values of the resistance and capacitance.

1. Find the resistance across terminals AB or the circuit shown.



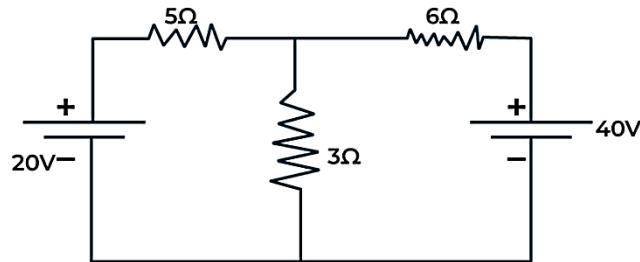
1. a) Derive the expression for the emf induced in a transformer.

b) A 125 kVA transformer having primary voltage of 2000 V at 50 Hz has 182 primary and 40 secondary turns. Neglecting losses, calculate (a) the full-load primary and secondary currents, (b) the no-load secondary induced e.m.f. and (c) the maximum flux in the core.

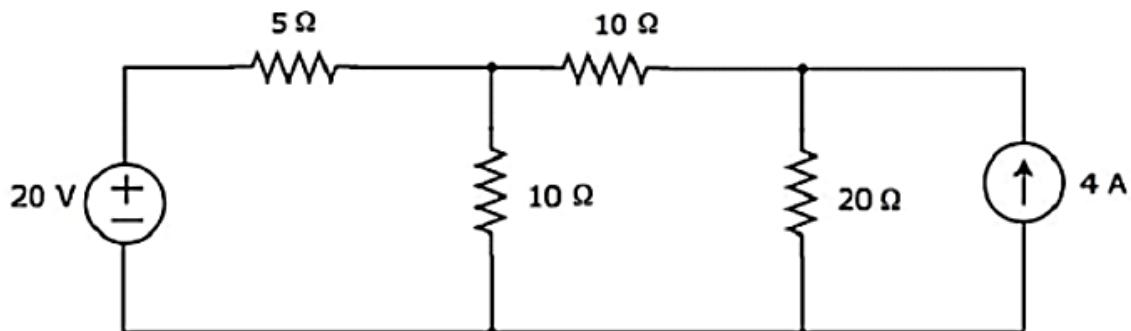
2. a) What are the different types of losses in a transformer.

- b) Write an expression for the efficiency and develop the condition for maximum efficiency.
- a) With the help of diagram explain how alternating emf is generated and derive the emf equation.
- b) A circuit containing a (a) resistance of $20\ \Omega$ alone (b) inductance of 10 mH alone and (c) capacitance of $300\ \mu\text{F}$ alone is connected across an alternating voltage source; write the expressions for the current when $v = 100 \sin 100\pi t$.

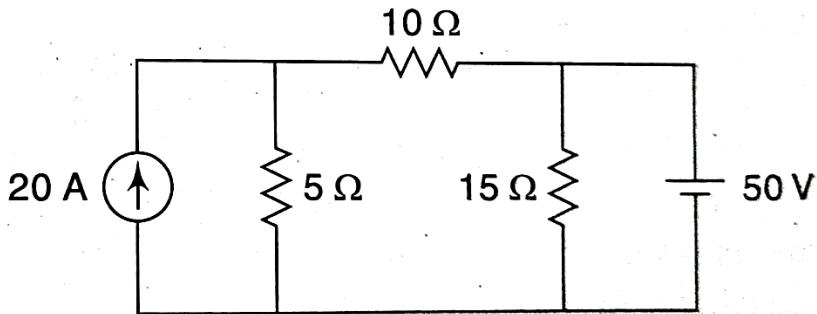
1. a) State and explain **Thevenin's theorem**. Derive the expression for Thevenin equivalent voltage and resistance. [5]
- b) Find current through 3Ω resistor in the circuit using Superposition Theorem. [5]



2. a) Compare mesh analysis and nodal analysis. [3]
- b) Find the current flowing through 20Ω resistor of the following circuit using Nodal analysis. [7]
3. a) State Norton's theorem. What are the limitations of this theorem.

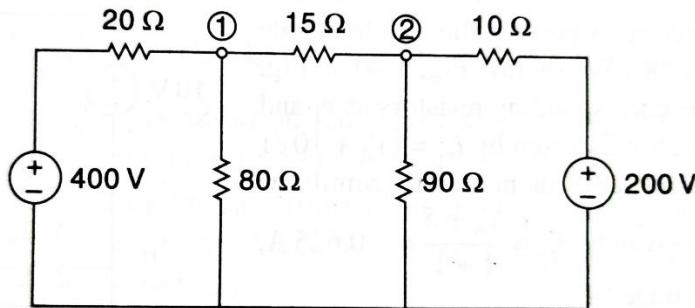


- b) Find the current through $40\ \Omega$ resistor using Thevenin's theorem.



4. a) State and Explain Kirchoff's voltage and current law.

b) Find current in the $15\ \Omega$ resistor using nodal method.



1. Explain the generation of AC voltage. The equation of an Alternating Current is $i=62.35\sin 323t$. Determine its i)Maximum value, ii)Frequency ,iii)RMS Value ,iv)Average Value ,v)Form Factor. [5+5]

2. Define power factor and What is the range of power factor? A resistor of $20\ \Omega$ an inductor of $0.2\ H$ and a capacitor of $100\ \mu F$ are connected in series across a $220V, 50Hz$ supply. Determine i) impedance, ii)current, iii)power factor, iv)power consumed. [2+8]

3. a) Derive a mathematical expression for R.M.S. value and average value of a sinusoidal voltage $v = V_m \sin \omega t$.

b) A resistor of $20\ \Omega$ an inductor of $0.2\ H$ and a capacitor of $100\ \mu F$ are connected in series across a $220V, 50Hz$ supply. Determine i) impedance, ii) current, iii) power factor, iv) power. [5+5]

4. Write a short note on power triangle. Explain why power in a pure inductance is equal to zero in an A.C. circuit.

5. a)Define Active power, Reactive power, Apparent power with proper units respectively.

b)A $4\ kW$ load takes a current of $20\ A$ from a $240\ V$ ac supply. Calculate the kVA and $KVAR$ of the load.

6. State the condition for resonance in a series RLC circuit and write the expression for resonant frequency. A circuit containing a (a) resistance of 20Ω alone (b) inductance of 10 mH alone and (c) capacitance of $300 \mu\text{F}$ alone is connected across an alternating voltage source; write the expressions for the current when $v = 100 \sin 100 \pi t$. [4+6]

1. Draw the exact equivalent circuit and the phasor diagram of a single phase transformer under lagging p.f load and describe briefly the various parameters involved in it. [5+5]

2. a) Define voltage regulation of a transformer.

b) Obtain the equivalent circuit parameters of a 3 kVA , $220/440 \text{ V}$, 50 Hz single phase transformer having following test results are:

(i) O.C. test: primary voltage = 220V , $I = 1\text{A}$, $W = 100\text{W}$.

(ii) S.C. test: primary voltage = 20V , S.C. current on the secondary side = 9A , $W = 75\text{W}$.

[2+8]

3. a) Prove that efficiency of transformer is maximum when iron loss is equal to copper loss.

b) A 200 kVA single-phase transformer has 1000 turns in the primary and 600 turns on the secondary. The primary winding is supplied from a $440\text{V}, 50\text{Hz}$ source. Find the i) secondary voltage at no load and ii) primary and secondary currents at the full load. [5+5]

4. a) Define ideal transformer. Draw and explain the no load phasor diagram of an ideal transformer.

b) The primary winding of a 50 Hz transformer is supplied from a 440 V , 50 Hz source and has 200 turns. Find the (i) peak value of flux (ii) voltage induced in the secondary winding if it has 50 turns