Code No: R201209 **R20** SET - 1

**I B. Tech II Semester Regular/Supplementary Examinations, August- 2022**

# ELECTRICAL CIRCUIT ANALYSIS –I

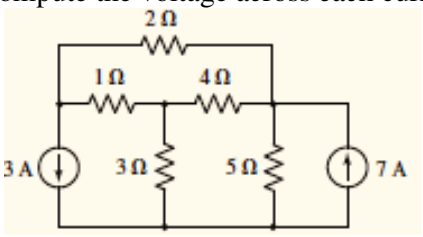
**(Only for EEE)**

Time: 3 hours Max. Marks: 70

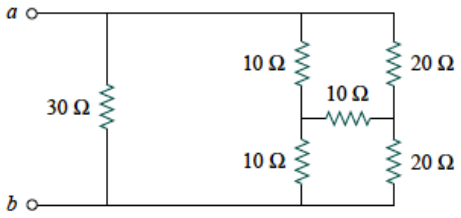
**Answer any five Questions one Question from Each Unit**
**All Questions Carry Equal Marks**

## Unit - I

1. a) For the circuit shown, compute the voltage across each current source. (7M)

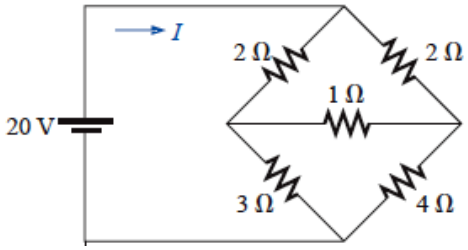



b) Obtain the equivalent resistance at the terminals a-b (7M)




**Or**

2. a) Using a Δ-Y or Y- Δ conversion, find the current *I* in the network (7M)




b) State and explain Kirchoff's Laws? (7M)

## Unit - II

3. a) Two identical coupled coils have an equivalent inductance of 80 mH when connected series aiding and 35 mH in series opposing. Find $L_1$, $L_2$, M and K. (7M)

b) A closed magnetic circuit of cast steel contains a 6 cm long path of cross-sectional area 1 $cm^2$ and a 2 cm path of cross-sectional area 0.5 $cm^2$. A coil of 200 turns is wound around the 6 cm length of the circuit and a current of 0.4A flows. Determine the flux density in the 2 cm path if the relative permeability of the cast steel is 750. (7M)

**Or**

4. a) Explain the analogy between electric and magnetic circuits? (7M)

b) A magnetic circuit of cross-sectional area 0.4 $cm^2$ consists of one part 3 cm long, of material having relative permeability 1200, and a second part 2 cm long of material having relative permeability750.With a 100-turn coil carrying 2A, find the value of flux existing in the circuit. (7M)



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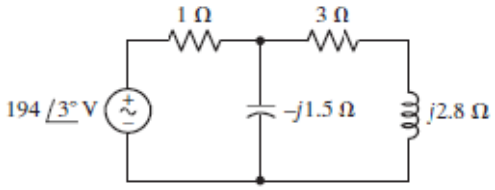
**Unit - III**

5. a) Calculate the average power absorbed by each passive element in the circuit shown, and verify that it equals the average power supplied by the source? (7M)

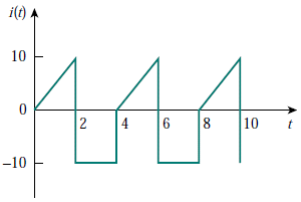



b) A coil of inductance 159.2mH and resistance 20 Ω is connected in series with a 60 resistor to a 240V, 50 Hz supply. Determine (i) the impedance of the circuit, (ii) the current in the circuit, (iii) the circuit phase angle, (iv) the p.d. across the 60 Ω resistor and (v) the p.d. across the coil. (vi) Draw the circuit phasor diagram showing all voltages. (7M)

**Or**

6. a) The voltage of a circuit is v = 200 sin ($\omega t + 30^0$) and the current is i = 50 sin ($\omega t + 60^o$). Calculate i. The average power, reactive volt-amperes, and apparent power ii. Find the circuit elements if $\omega=100\pi$ rad /sec. (7M)

b) Determine the RMS value of the current waveform shown below? If this current waveform is passed through 2 Ω resistor find the average power absorbed by the resistor? (7M)




**Unit – IV**

7. a) A coil of resistance 25 Ω and inductance 100 mH is connected in series with a capacitance of 0.12 μF across a 200V, variable frequency supply. Calculate (i) the resonant frequency, (ii) the current at resonance and (iii) the factor by which the voltage across the reactance is greater than the supply voltage. (7M)

b) A series RLC Circuit has a quality factor of 5 at 50 rad/s. The current flowing through the circuit at resonance is 10 A and the supply voltage is 100 V. Find the Circuit constants? (7M)

**Or**

8. a) A coil of 10 Ω resistance and 0.2 H inductance is connected in parallel with a variable capacitance across a 220 V, 50 Hz supply. Calculate (i) the capacitance of the capacitor for resonance (ii) the dynamic impedance of the circuit and the supply current (7M)

b) For an R.L series circuit, with L varied from 0 to ∞, draw the current locus (7M)

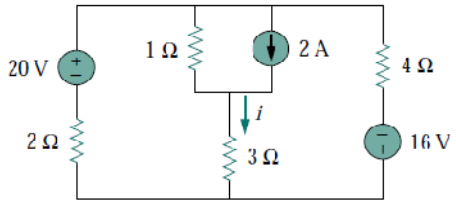


|''|''|||''|'''|||'|

**Unit - V**

9. a) State and explain Milliman's theorem with an example? (7M)

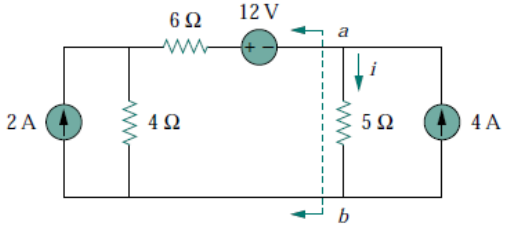
b) Apply the superposition principle to find i and power delivered to the 3 Ω resistor in the circuit shown below? (7M)




**Or**

10. a) State and explain maximum power transfer theorem with an example for DC excitation? (7M)

b) Obtain the Norton equivalent of the circuit in Fig. shown to the left of terminals a-b. Use the result to find current i. (7M)



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**I B. Tech II Semester Regular/Supplementary Examinations, August- 2022**

# ELECTRICAL CIRCUIT ANALYSIS –I

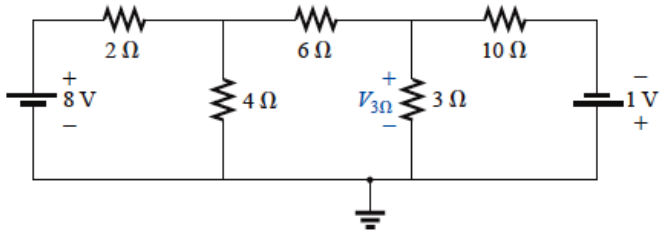
**(Only for EEE)**

Time: 3 hours Max. Marks: 70

**Answer any five Questions one Question from Each Unit**
**All Questions Carry Equal Marks**

## Unit - I

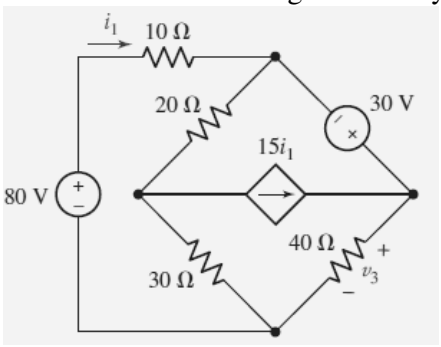
1. a) Find the voltage across the 3 Ω resistor by using nodal analysis. (7M)




b) Explain Y to Δ transformation technique? (7M)

**Or**

2. a) Determine $v_3$ for the circuit shown below using mesh analysis? (7M)




b) Explain source transformation technique with an example? (7M)

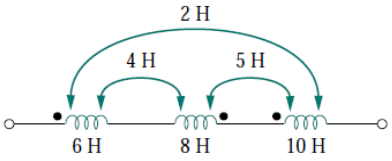
## Unit - II

3. a) Obtain an expression for co-efficient of coupling. (7M)

b) A mild steel ring has a radius of 50 mm and a cross sectional area of 400 $mm^2$. A current of 0.5 A flows in a coil wound uniformly around the ring and the flux produced is 0.1 mWb. If the relative permeability at this value of current is 200 find (i) the reluctance of the mild steel (ii) the number of turns on the coil. (7M)

**Or**

4. a) For the three coupled coils in Fig., calculate the total inductance. (7M)




b) A mild steel closed magnetic circuit has a mean length of 75 mm and a cross-sectional area of 320.2 $mm^2$. A current of 0.4 A flows in a coil wound uniformly around the circuit and the flux produced is 200 μWb. If the relative permeability of the steel at this value of current is 400 find (i) the reluctance of the material and (ii) the number of turns of the coil. (7M)



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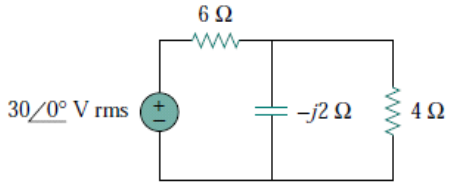
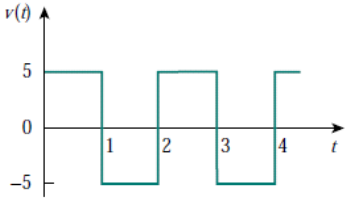
**Unit - III**

5. a) Determine the power factor of the circuit seen by the source for the network shown below. Also calculate the average power delivered by the source. (7M)

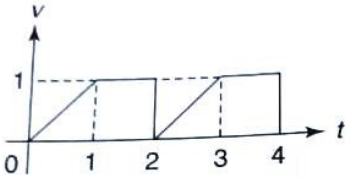



b) Calculate the RMS value of the current wave form shown below? (7M)




**Or**

6. a) Find the average and RMS values of the voltage waveform shown? (7M)




b) A load of 22 kW operates at 0.8 lagging power factor when connected to a 420 V, single phase 50 Hz source. Find (i) Current in the load (ii) power factor angle (iii) impedance (iv) resistance of the load (v) reactance of the load (vi) Voltage and current equations. (7M)

**Unit - IV**

7. a) A coil of negligible resistance and inductance 100mH is connected in series with a capacitance of 2 μF and a resistance of 10Ω across a 50V, variable frequency supply. Determine (a) the resonant frequency, (b) the current at resonance, (c) the voltage across the coil and the capacitor at resonance, and (d) the Q-factor of the circuit. (7M)

b) A capacitor C is in series with a 75 Ω resistor and a 12 H coil across a 220 V, 60 Hz supply. Determine the value of 'C' that resonates the circuit (7M)

**Or**

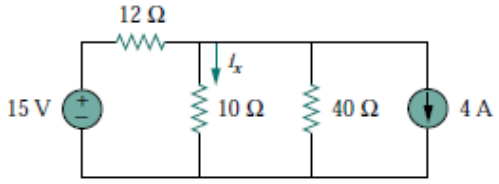
8. a) A series R–L–C circuit has a supply input of 5 volts. Given that inductance, L = 5 mH, resistance, R = 75 Ω and capacitance, C = 0.2 μF, determine (i) the resonant frequency, (ii) the value of voltage across the capacitor at the resonant frequency, (iii) the frequency at which the p.d. across the capacitance is a maximum, and (iv) the value of the maximum voltage across the capacitor (7M)

b) Show that the locus of current of a series circuit consisting of resistance and inductance with resistance varied and inductance reactance fixed, when supplied by a constant AC Voltage source, lies on circular path (7M)

**Unit - V**

9. a) State and explain Norton's theorem with an example? (7M)

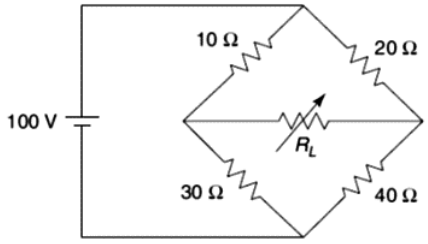
   b) For the circuit shown below in calculate ix and the power dissipated by the 10-Ω resistor using superposition. (7M)




**Or**

10. a) State and explain reciprocity theorem with an example? (7M)

    b) Find the value of $R_L$ for the maximum power to be transferred to it and find maximum power that is transferred (7M)



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**I B. Tech II Semester Regular/Supplementary Examinations, August- 2022**

# ELECTRICAL CIRCUIT ANALYSIS –I

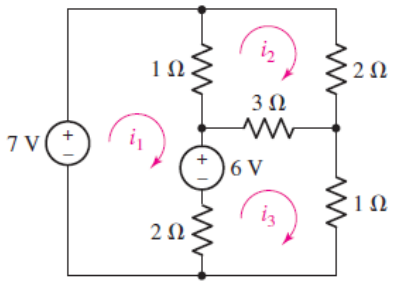
**(Only for EEE)**

Time: 3 hours Max. Marks: 70

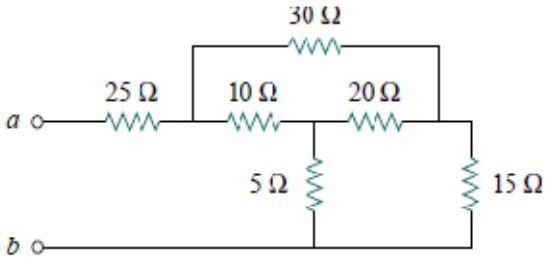
**Answer any five Questions one Question from Each Unit**
**All Questions Carry Equal Marks**

## Unit - I

1. a) Use mesh analysis to determine the three mesh currents in the circuit (7M)

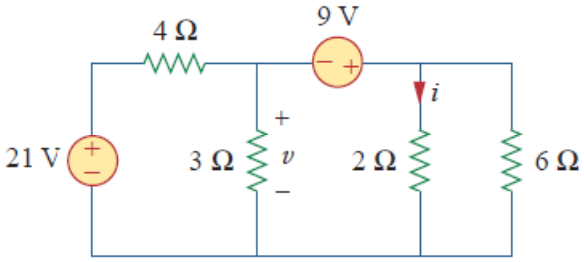



b) Obtain the equivalent resistance at the terminals *a-b* (7M)

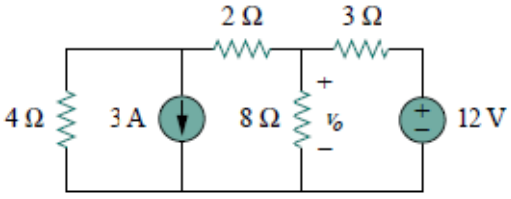



**Or**

2. a) Find v and i for the circuit shown below? (7M)




b) Find $v_o$ in the circuit shown using source transformation (7M)




## Unit – II

3. a) State and explain faraday's laws of electromagnetic induction? (7M)

b) A coil of 300 turns is wound uniformly on a ring of non-magnetic material. The ring has a mean circumference of 40 cm and a uniform cross-sectional area of 4 cm2. If the current in the coil is 5A, calculate (i) the magnetic field strength, (ii) the flux density and (iii) the total magnetic flux in the ring. (7M)



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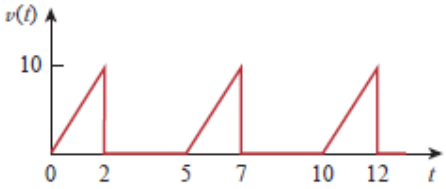
**Or**

4. a) Explain the concept of self and mutual inductance? (7M)

   b) A silicon iron ring is wound with 800 turns, the ring having a mean diameter of 120mm and a cross-sectional area of 400 $mm^2$. If when carrying a current of 0.5A the relative permeability is found to be 3000, calculate (i) the self-inductance of the coil, (ii) the induced e.m.f. if the current is reduced to zero in 80 ms. (7M)

**Unit - III**

5. a) Find the rms value of the voltage waveform shown as well as the average power absorbed by a 2 Ω resistor when the voltage is applied across the resistor. (7M)

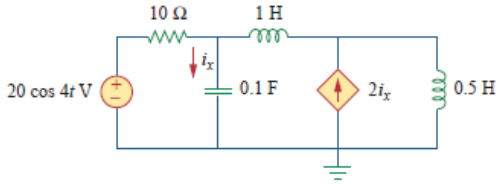



   b) A 20 μF capacitor in series with a coil of resistance 6 Ω and inductance 50mH is connected to a 200V, 50 Hz supply. Calculate (i) the circuit impedance (ii) the current flowing (iii) the phase angle between voltage and current (iv) the voltage across the coil (v) the voltage across the capacitor. (7M)

**Or**

6. a) Two impedances $Z_1 = 40\angle 30^0\ \Omega$ and $Z_2 = 30\angle 60^0\ \Omega$ are connected in series across a single phase 230 V, 50 Hz supply. Calculate (i) current drawn (ii) power factor (iii) power consumed. (7M)

   b) Find $i_x$ in the circuit shown in fig. using nodal analysis. (7M)




**Unit - IV**

7. a) For an R.L series circuit, with R varied from 0 to ∞, show that current locus is a semi-circle (7M)

   b) A series RLC circuit which resonates at 500 kHz has R = 25 Ω , L = 100 μH and C = 1000μ F. Determine the quality factor, new value of C required to resonate at 500 kHz, when the value of L is doubled and the new quality factor. (7M)

Or

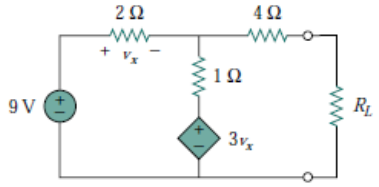
8. a) A coil of inductance 80mH and negligible resistance is connected in series with a capacitance of 0.25 μF and a resistor of resistance 12.5 Ω across a 100V, variable frequency supply. Determine (i) the resonant frequency, and (ii) the current at resonance. How many times greater than the supply voltage is the voltage across the reactance's at resonance? (7M)

   b) For an R.L series circuit, with L varied from 0 to ∞, draw the current locus (7M)

**Unit – V**

9. a) State and explain Thevenin;s theorem with an example? (7M)

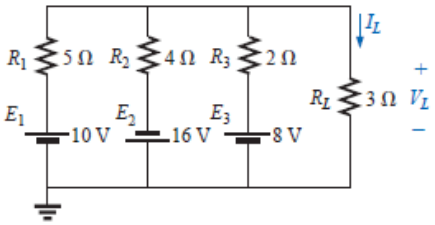
b) Find the value of $R_L$ that will draw the maximum power and hence find the value of maximum power delivered? (7M)




**Or**

10. a) State and explain maximum power transfer theorem with an example for AC excitation? (7M)

b) Using Millman's theorem, find the current through and voltage across the resistor RL of Fig. shown (7M)



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**I B. Tech II Semester Regular/Supplementary Examinations, August- 2022**

# ELECTRICAL CIRCUIT ANALYSIS –I

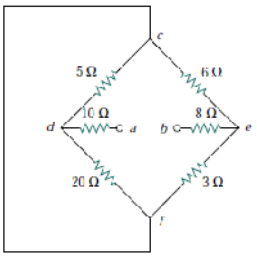
**(Only for EEE)**

Time: 3 hours Max. Marks: 70

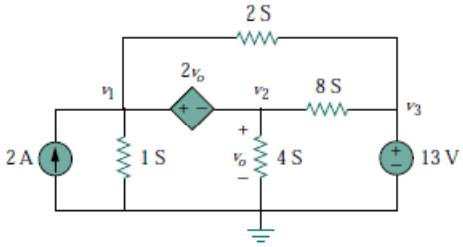
**Answer any five Questions one Question from Each Unit**
**All Questions Carry Equal Marks**

## Unit - I

1. a) Find the equivalent resistance $R_{ab}$ in the circuit shown in Fig. (7M)

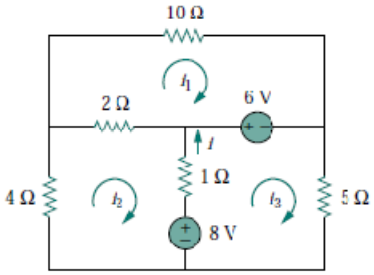



b) Determine voltages $v_1$ through $v_3$ in the circuit shown in Fig. using nodal analysis. (7M)

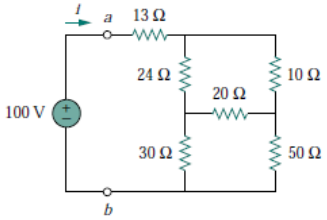



**Or**

2. a) Apply mesh analysis to find $i$ in Fig. (7M)




b) For the network shown below find $R_{ab}$ and i. (7M)




## Unit - II

3. a) Define the following: (i) Magnetic field (ii) Magnetic flux (iii) Magnetic flux density (iv) MMF (v) Reluctance (vi) Permeability (vii) Magnetic field strength (7M)

b) A flux of 30 mWb links with a 1200 turn coil when a current of 5A is passing through the coil. Calculate (i) the inductance of the coil, (ii) the energy stored in the magnetic field, and (iii) the average e.m.f. induced if the current is reduced to zero in 0.20 s (7M)



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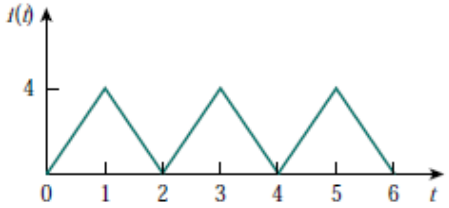
**Or**

4. a) Explain the principle of 'dot' rule used for the analysis of coupled circuits with an example? (7M)

   b) Two coils have a mutual inductance of 0.2 H. If the current in one coil is changed from 10 A to 4 A in 10 ms, calculate (i) the average induced e.m.f. in the second coil, (ii) the change of flux linked with the second coil if it is wound with 500 turns. (7M)

**Unit - III**

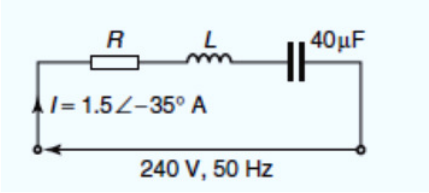
5. a) Find the rms value of the current waveform of Fig. shown. If the current flows through a 9-Ω resistor, calculate the average power absorbed by the resistor. (7M)



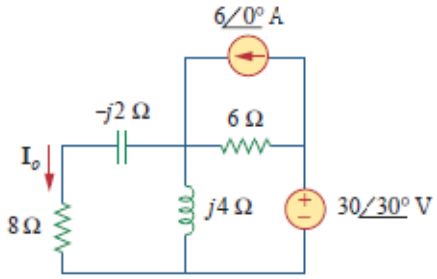

   b) Three impedances $Z_1$=10+j31.4Ω, $Z_2$=6+j8 Ω, and $Z_3$ = 3-j4 Ω are connected in parallel across a 200V AC supply. Calculate total admittance of the circuit, total current, power factor and power (7M)

**Or**

6. a) Find the values of resistance R and inductance L in the circuit of Fig. (7M)




   b) Find $I_0$ in Fig. using mesh analysis. (7M)




**Unit - IV**

7. a) Define the following w.r.to. series resonance circuit: (7M)
   (i) Quality Factor (ii) Resonant frequency (iii) Band width (iv) Half power frequencies (v) selectivity

   b) A series RLC circuit is connected to a 200 V ac supply. The Current drawn by the circuit at resonance is 20 A. The voltage drop across the capacitor is 5000 V at resonance. Calculate resistance and inductance if the capacitance is 4μF. Also calculate resonant frequency. (7M)

**Or**

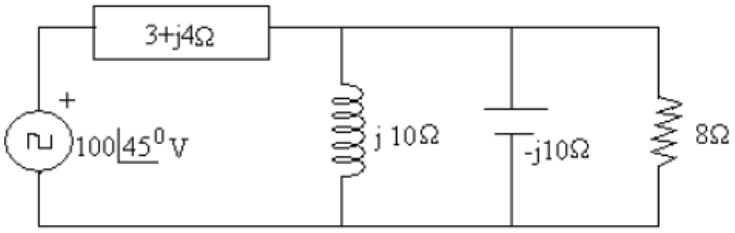
8. a) A series resonant circuit has a bandwidth of 100 Hz and contains a 20 mH inductance and a 2 μF capacitance. Determine (i) $f_o$ (ii) Q (iii) $Z_{in}$ at resonance (iv) $f_2$ . (7M)

   b) For an R.C series circuit, with R varied from 0 to ∞, draw the current locus? (7M)

**Unit – V**

9. a) State and explain super position theorem with an example? (7M)

   b) Find the current through 8 Ω resistor using Thevenin's theorem, for the circuit shown below (7M)




**Or**

10. a) State and explain compensation theorem with an example? (7M)

    b) Find the maximum power that can be delivered to the resistor *R* in the circuit shown below. (7M)