AC CIRCUITS [Even numbers]

EXERCISES

1. Explain why in a circuit containing L and C, current is maximum or minimum at a particular frequency. A series tuned circuit is to be resonant at 800 kHz. If L=40 microHenry with R=4.02ohms, determine the value of C required. (0.99nF, 16kHz)

2. A 200 microHenry coil in series with a capacitor form a circuit resonant at 800 kHz. When the circuit is connected across a constant voltage of 800kHz frequency, the voltage across the capacitor is 100 mV. When a non-inductive resistance is connected in series with the tuned circuit, the capacitor voltage fell to 50mV. Calculate (198μF, 50Ω)

   (a) The capacitance

   (b) The original series resistance.

3. Derive an expression for the frequency of resonance of the circuit shown in fig.P.2.1 in terms of L and C (40.0Ω; 5.0A; 333μF)

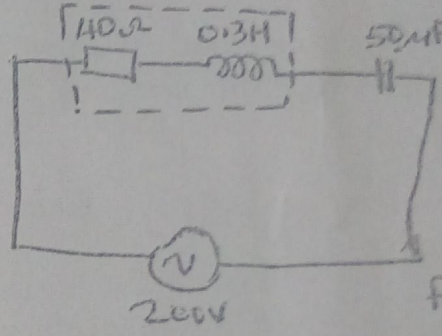


fig P.2.1

   (a) Calculate this frequency.

   (b) At resonance, determine

      (i) The total impedance of the circuit

      (ii) The circuit current

      (iii) The value of C to give series resonance with the same coil at

4. A series citcuit takes a current of 5 amps at a power factor 0f 0.866 leading when connected across a 240 volts alternating supply. Draw a simple diagram of the circuit, and calculate (48.0Ω; 41.6Ω; 24.0Ω; 1039W; 600W)

   (a) The impedance

   (b) The resistance

   (c) The reactance

   (d) The active power

   (e) The reactive power

Sketch the vector diagram.

5. For the circuit of fig.P.2.2, calculate (9.42Ω; 10.24Ω; 4.24Ω; 46.95A; 40Ω; 50.0A; 43.5V; 43.5V)

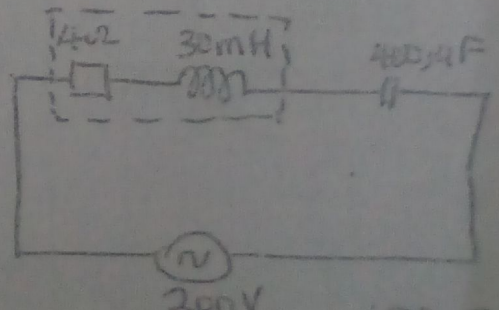


fig P.2.2

   (a) The resistance of the coil

   (b) The impedance of the col

   (c) The impedance of the circuit

   (d) The circuit current

e, calculate

(a) The impedance and current of the circuit

(b) The voltage across the coil and the capacitor

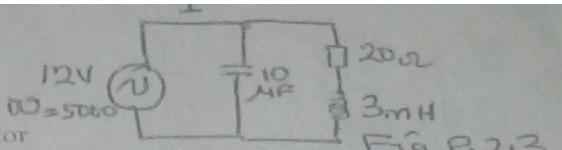


Fig P.2.3

6. For the circuit of fig P,2.3, determine the impedances of the two sectors and thence determine the circuit current. (20.0Ω; 25.0Ω; 24.32Ω; 0.49A]

7. A 10nF capacitor is connected in series with a coil of 10 mH inductance and a 40 ohms resistance. Calculate frequency of resonance. If a voltage of 2 volts I to appear across the capacitor at resonance, what total voltage must be applied to the series combination? (15.92kHz; 80.0mV)

8. A coil of inductance 0.04H and negligible resistance is connected in parallel with a 10 ohms resistor across a 240 volt supply of frequency 50Hz. Sketch the vector diagram of the circuit and calculate (24.0A; 19.0A; 43.0A; 5.76kW; 0.56]

(a) The current through the resistor

(b) The current through the coil

(c) The supply current

(d) The power in the circuit

(e) The power factor of the circuit

9. A voltage of 240 volts at a frequency of 50Hz is applied to a circuit which has a 60 ohms resistor in parallel with a capacitance of 40 microFarad. Sketch he phasor or vector diagram for the circuit. Calculate [4.0A; 3.0A; 7.0A; 0.57; 960W]

(a) The resistor current

(b) The capacitor current

(c) The supply current

(d)The power factor

(e) The active power

10. A coil of L=10mH and R=5 ohms is connected in series with a 0.0002 microFarad capacitor, ad a voltage of 1 mV (rms) is connected across both component. Calculate [12.6kHz; 0.20A; 1.4

(a) The resonance frequency

(b) The current at this frequency

(c) The capacitor voltage at resonance

(d) The power absorbed at resonance

11. A certain coil drew a current of amps (rms) when connected across 240 volts (rms) 50Hz supp The true power consumed by the coil was found to be 960 watts. Determine the power factor o the coil as well as its resistance. (0.80; 38.4Ω]

DC CIRCUITS & NETWORK THEOREM

EXERCISES.

1. State kirchoff's laws for networks. Use the appropriate kirchoff's law to determine the value of current flowing through the 1ohm (load)resistance in fig p.1.1 (0.2625A)

2. In circuit of ifg.p.1.2,calculate the current through the 4 ohms resistance, and the power dissipated in the 12 ohms resistance. (1.0A; 6.75W)

3. In fig p.1.3 circuit, determine the voltage across the 4 ohms resistance, using kirchoff's law. (8.0V)

4. State kirchoff's law. Use this law to determine the current in the 1.6 ohms resistance, and also the voltage across it in p.1.4 (3.2V)

5. State the superposition theorem. Use this theorem to determine the current flowing in the 1 ohm resistance of fig.p.1.5 (0.059A)

6. In the circuit 0f fig.p.1.6. ,determine the value of current flowing through the 8 ohms resistance as well as its direction. (1.0A →)

7. Fig.1.7 shows a circuit of two voltage sources feeding T-network. Calculate the value of the current marked A,B,C. [-0.5A; 1.67A; 1.17A)

8. State thevenin's network theorem. For th circuit of figp.1.8, calculate (1.67A; 0.14W)

   (a) The current along the arm XY

   (b) The power dissipated in the 3.5 ohms resistance.

9. Use the superposition theorem to determine (1.14A; 4.0W)

   (a) The current supplied by the 6-volts battery,

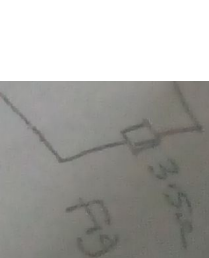
   (b) The power dissipated by the battery in fig.p.1.9

10. Use Kirchoff's voltage lawto determine the source current as well as the current flowing in the 20 ohms resistance of fig.1.10 (7.0A; 1.0A)

11. Determine the equivalent Thevenin (circuit) diagram of fig.1.11, clearly giving the value of the equivalent voltage and resistance. (5.0V; 17.5Ω)

12. In fig.1.12, determine the current flowing through the 10 ohms resistance. Determine also the voltage developed across the 4 ohms resistance. (3.0A; 12.0V)

13. Fig.p.1.13 shows a bridge...T circuit. Determine the voltages across the resistance of 5 ohms and 2 ohms (30V; 8.0V)



14-B

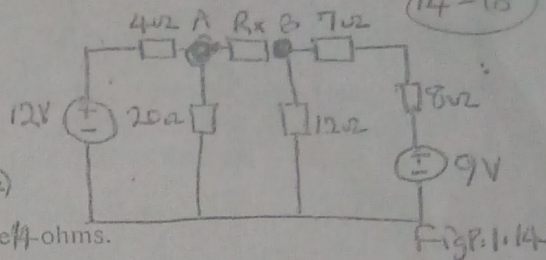


Fig P.1.14

For the circuit of fig.P.1.14, calculate with to terminals AB

(a) The Thevenin equivalent voltage and resistance, (6.0V, 10Ω)

(b) The value of Rx to dissipate maximum energy, (10Ω)

(c) The current in and the voltage across Rx if its value is 4 ohms. (0.25A; 3.5V)

15. State norton's network theorem. Determine the Norton equivalent circuit parameters to the circuit offig.p.1.15. (1.75A; 6.4Ω)

16. You are given the circuit of fig.P.1.16, calculate the current in the 10 ohms resistance. (4.53A)

17. Find the Thevenin equivalent of fig.P.1.17 circuit (1.0V, 75.0Ω)

18. Explain why kirchiff's current law is regarded as a statement of conservation of electric charge. Use this law to determine the current flowing through resistor R.6 in fig.P.1.18. You are given that E=2volts, R.1=500 ohms , R.2=1000 ohms, R.3=400 ohms, R.4=800 ohms, R.5=500 ohms, R.6=400 ohms (113.0mA)

19. If all the resistance in fig.P.1.18 have their values halved when E=4 volts, determine the current in R.6 (3.07mA)

20. Still using fig.P.1.18, determine the value of the current from the battery when the component retain their values as in question 19. (5.73mA)

21. Deduce the Theveninequivalentcircuit for terminals AB in fig,P,1.19. State the value of the impedance which will be connected across AB to give maximum power output. Calculate this maximum power. [Take V_{Th}=15V] [300+j300Ω; 300-j300Ω; 0.24W)

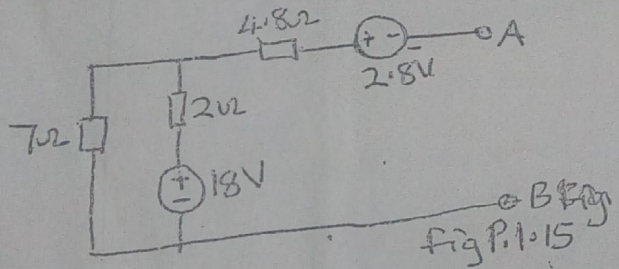


Fig P.1.15

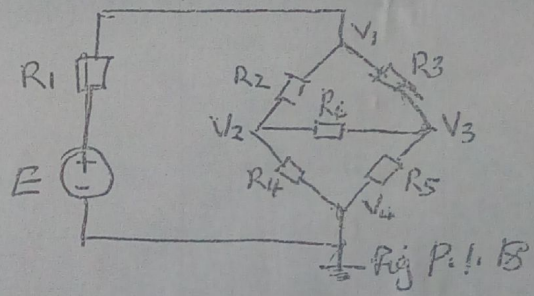


Fig P.1.18

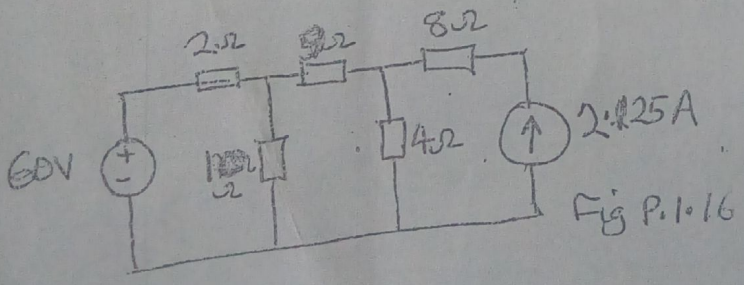


Fig P.1.16

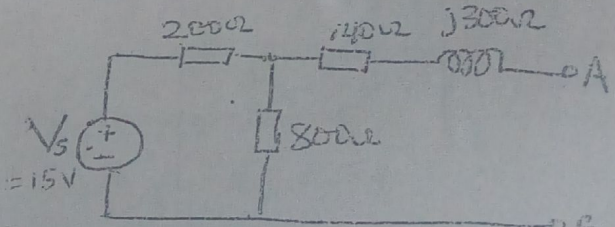


Fig P.1.19

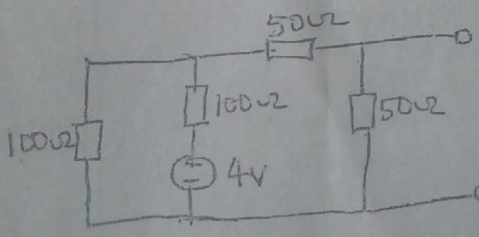


Fig P.1.17