Set No. 1

I B.Tech Regular Examinations, Apr/May 2007
BASIC ELECTRICAL ENGINEERING
(Common to Computer Science & Engineering, Information Technology
and Computer Science & Systems Engineering)
Time: 3 hours
Max Marks: 80
Answer any FIVE Questions
All Questions carry equal marks
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1. (a) State and explain Kirchoff's Laws?

   (b) Calculate the magnitude and direction of current in the 10 ohms resistor. as shown in figure 1 that the power delivered by source is equal to power dissipated in the resistors. (All resistance are in ohms). [6+10]
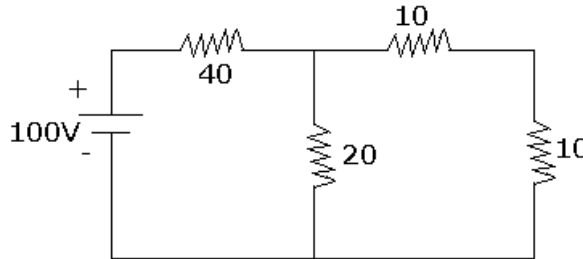

Figure 1

2. (a) Obtain an expression for the voltage drop across an inductance

   (b) An air cored toroidal coil has 450 turns and a mean diameter of 30 cm and a cross sectional area of $5 cm^2$. Calculate the inductance of the coil and the average induced e.m.f if a current of 4 Amp is reversed in 60 milliseconds.

   [6+10]

3. A 600 - turn coil is wound on the central limb of the cast steel frame as shown in figure 3. A total of 1.8×10^{-3} wb. is required in the air gap. Find out the current required in the coil. Assume gap density is uniform, and that all flux lines pass straight across the gap. [16]
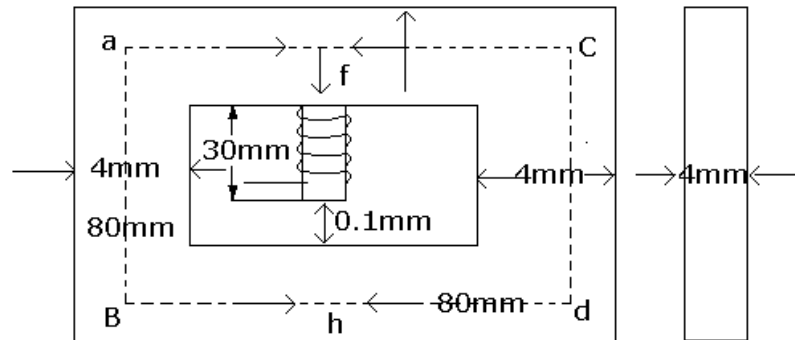

Figure 3

4. (a) Define the following

      i. Alternating Quantity

     ii. R.M.S. Value

   iii. Average value

   iv. Form factor.

(b) A coil having a resistance of 10 ohms and an inductance of 0.2H is connected in series with a 100×10^{-6} F capacitor across a 230V, 50Hz supply, Calculate

      i. The active and reactive components of the current

     ii. the voltage across the coil, Draw the phasor diagram.   [8+8]

5. (a) What is an ideal transformer Draw its no load phasor diagram.

  (b) The primary winding of a 50 HZ single phase transformer has 480 turns and is fed from 6400 V supply. The secondary winding has 20 turns. Find the peak value of flux in the core and the secondary Voltage.   [8+8]

6. What is the principle of operation of a dc generator ? Why is commutator and brush arrangement necessary for the operation of dc generator.   [16]

7. Explain with the help of suitable diagrams how rotating magnetic field is produced in a three phase induction motor.   [16]

8. (a) Discusss the classification of electrical instruments.

  (b) Explain the significance of controlling torque and damping torque relevant to the operation of indicating instruments.   [8+8]

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1. (a) Write down KVL and KCL in point form?

    (b) For the circuit as shown in figure 1, Calculate the current in the various branches and the power delivered and consumed?   [6+10]
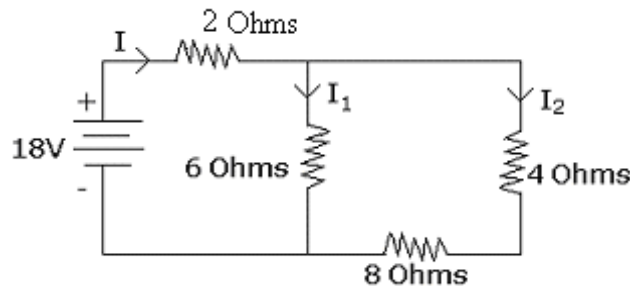

Figure 1

2. Calculate the current I in the circuit and the resistance between the terminals A&B (All Resistace are in Ohms). as shown in figure 2   [16]
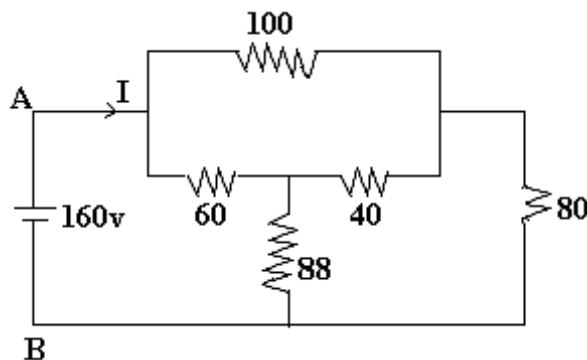

Figure 2

3. (a) Explain the magnetization characteristics of Ferromagnetic materials: with sketches/ graphs

    (b) An iron ring of mean length 50 cm has an air gap of 3 mm and a winding of 200 turns. If the permeability of iron core is 400, and the winding carries a current of 1.5 amp., Calculate the value of the flux density.   [8+8]

4. (a) Define the following

    i. Alternating Quantity
    ii. R.M.S. Value

      iii. Average value

      iv. Form factor.

(b) A coil having a resistance of 10 ohms and an inductance of 0.2H is connected in series with a 100×10^{-6} F capacitor across a 230V, 50Hz supply, Calculate

    i. The active and reactive components of the current

    ii. the voltage across the coil, Draw the phasor diagram.   [8+8]

5. Draw the phasor diagrams of a transformer at no load and full load lagging power factor conditions and explain the operation of a transformer.   [16]

6. Explain constructional features and working principles of DC generator.   [16]

7. Explain with the help of suitable diagrams how rotating magnetic field is produced in a three phase induction motor.   [16]

8. (a) Discusss the classification of electrical instruments.

    (b) Explain the significance of controlling torque and damping torque relevant to the operation of indicating instruments.   [8+8]

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Set No. 3

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1. (a) What is meant by electrical power? Give different forms of expressions for electrical power with units?

   (b) Define electrical energy and its units?

   (c) A current of 5 Amps. flows in a resistor of resistance 8 ohms. Determine the rate of heat dissipation and also the heat dissipated in 10 minutes? [6+4+6]

2. State and explain superposition theorem

   (a) When and how is the theorem used?

   (b) Using superposition theorem determine the current through 3 ohm resistor (All resistaces are in ohms). as shown in figure 2 [10+6]
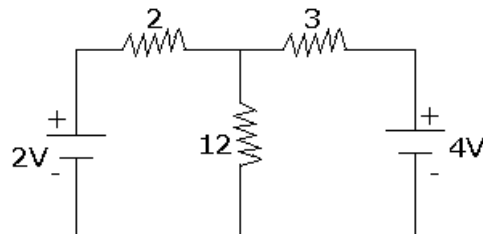

Figure 2

3. (a) Define the terms

      i. Magnetic flux
      ii. Magnetic flux density
      iii. Magneto motive force
      iv. Reluctance.

   (b) The air gap in a magnetic circuits is 1.5 mm long and 2500 mm^2 in cross sectional area. Calculate

      i. the reluctance of the air gap
      ii. the m.m.f required to set up a flux of 800 $\times 10^{-6}$ wb. in the air gap.[8+8]

4. (a) Define the following

      i. Alternating Quantity
      ii. R.M.S. Value
      iii. Average value

iv. Form factor.

(b) A coil having a resistance of 10 ohms and an inductance of 0.2H is connected in series with a 100×10^{-6} F capacitor across a 230V, 50Hz supply, Calculate

    i. The active and reactive components of the current

    ii. the voltage across the coil, Draw the phasor diagram.   [8+8]

5. Explain the working of a transformer at no load and full load conditions with neat diagrams.   [16]

6. (a) Derive the expression of induced emf of dc generator.

  (b) An 8 pole lap wound dc generator has 960 conductors, a flux of 40 milliwebers and is driven at 400 rpm. Find induced emf.   [8+8]

7. Explain with the help of suitable diagrams how rotating magnetic field is produced in a three phase induction motor.   [16]

8. With a neat sketch explain in detail moving iron repulsion type instrument.   [16]

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1. (a) Write down KVL and KCL in point form?

   (b) For the circuit as shown in figure 1, Calculate the current in the various branches and the power delivered and consumed?   [6+10]
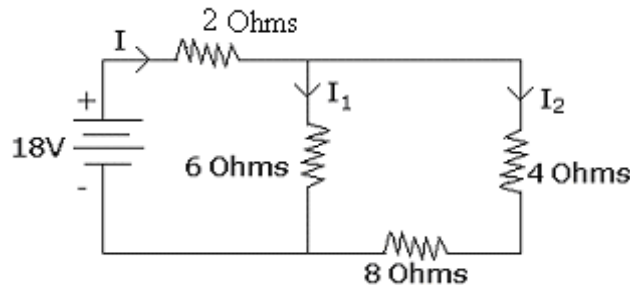

Figure 1

2. Using Thevenin's theorem calculate the current I through the resistance connected between the terminal A & B (All resistances are in ohms). as shown in figure 2   [16]
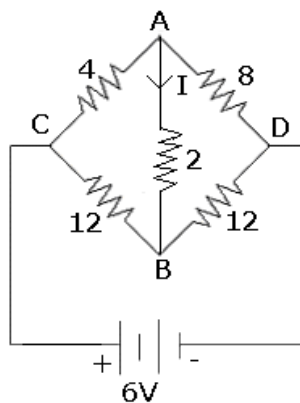

Figure 2

3. (a) Two coils 1 and 2 having self inductances L_1, and L_2 henrys respectively and mutual inductance M are wound coaxially on an insulating cylinder. Derive an expression for the total inductance when the two coils are connected with fluxes in aiding position and opposing position (differential)

   (b) The combined inductance of two coils connected in series is 1.2 H or 0.2 H depending on the relative directions of the current in the coils. If one of coils has a self inductance of 0.4H; Calculate

       i. Self inductance of the second coil

    ii. Mutual inductance between the coil

    iii. the coupling coefficient. [8+8]

4. A Voltage of (100+ J 60) volts drives a current of (4 − J5) Amp through a series R − L − C circuit. Determine

(a) The complex expression for impedance

(b) Power consumed

(c) Power factor

(d) Draw the phasor diagram. [4+4+4+4]

5. (a) Derive an emf equation of a single phase transformer .

(b) The maximum flux density in the core of 250 /3000 Volts 50 HZ single phase transformer is 1.2 webers per square meter. If the emf per turn is 8 volts determine primary and secondary turns and area of the core. [8+8]

6. (a) Derive the expression of induced emf of dc generator.

(b) An 8 pole lap wound dc generator has 960 conductors, a flux of 40 milliwebers and is driven at 400 rpm. Find induced emf. [8+8]

7. (a) Explain the working principle of three phase induction motor.

(b) A 6 pole induction motor is fed by three phase 50 HZ supply and running with a full load slip of 3%. Find the full load speed of induction motor and also the frequency of rotor emf. [8+8]

8. With a neat sketch explain in detail moving iron attraction type instrument. [16]

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