Code No: A109210504 **R09** **Set No. 2**

II B.Tech I Semester Examinations,MAY 2011
BASIC ELECTRICAL ENGINEERING
Common to Information Technology, Computer Science And Engineering
Time: 3 hours **Max Marks: 75**
Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Explain ohm's Law and discuss the different Factors on which the resistance is dependent?
   (b) Calculate the resistance of copper conductor having a length of 2 km and a cross-section of 22 mm^2. Assume the resistivity is 18×10^{-9}ohm-m. [7+8]
2. (a) Discuss the classification of d.c generators with suitable diagrams.
   (b) A 10KW shunt generator supplies load at a terminal voltage of 200 volts. The shunt field resistance is 100 ohms and armature resistance is 0.1 ohm. Calculate the e.m.f induced in the generator. [7+8]
3. (a) Derive the condition for maximum torque under running condition of 3-phase induction Motor
   (b) A 50 Hz, 4-pole, 3-phase induction motor has a rotor current of frequency 2Hz. Determine
      i. the slip and
      ii. speed of the motor. [7+8]
4. (a) A current of 10A flows in a series circuit consisting of R = 10 Ω; L = 0.1 H and C = 100 μF. Find the power, and impedance, if the frequency of the supply is 50Hz.
   (b) A 50 Hz sinusoidal voltage; V=141 sin wt is supplied to a series R-L circuit comprising of R=3 Ω , and L=0.01272 henry. Compute :
      i. the effective value of the steady state current as well as the relative phase angle;
      ii. the instantaneous current (time equation);
      iii. effective magnitude, the phase angle of the voltage drops appearing across each circuit element ? [7+8]
5. With neat sketches, explain the construction and functions of the various parts of a d.c. machine. [15]
6. Explain the construction and working principle of PMMC instruments and list out its advantages. [15]
7. A 1- phase transformer takes 10A on no-load at a power factor of 0.1. The turns ratio 4:1. If a load is supplied by the secondary at 200 A, and a power factor of 0.8, find the primary current, and the power factor. Neglect the internal voltage drops in a transformer and also draw the phasor diagram. [15]

8. (a) Three resistances are connected in star, determine its equivalent delta configuration.

   (b) Derive the relation for conversion from delta to star connection. [8+7]

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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. With neat sketches, explain the construction and functions of the various parts of a d.c Generator. [15]

2. (a) Explain the construction of Transformer along with neat diagram.
   (b) A single - phase transformer has 1,000 turns on the primary and 200 turns on the secondary. The no-load current is 3 A at P.f of 0.2 lagging. Calculate the primary current, and P.f when secondary current is 280 A at a P.f of 0.8 lagging. [7+8]

3. Describe the various controlling systems used in measuring systems with neat sketches. [15]

4. Find the voltage V_{AB} in the circuit shown in below figure 1 and drop across each branch. [15]

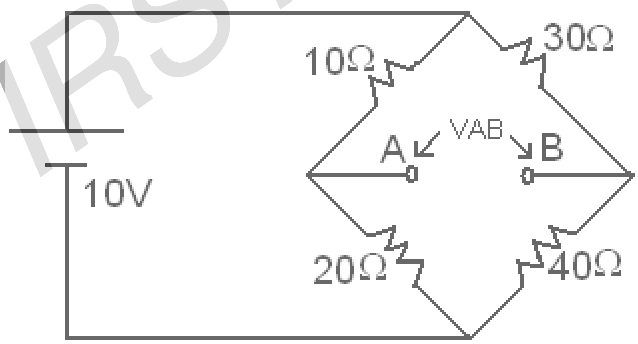

Figure 1:

5. (a) State and explain Thevenin's theorem.
   (b) Using Thevenin's theorem, find the current through 5Ω resistor, the circuit shown below in figure 2. [6+9]

6. (a) Explain the total losses in a DC machine?
   (b) An 800 kW, 500 V DC shunt generator has fallowing data..
   armature resistance is 0.005ohms, mechanical losses is 10 kW, iron losses is 11kW, shunt field resistance is 50 ohms, brush contact drop is 1 V per brush and stray loss is 1% of output. Find
      i. efficiency at full load

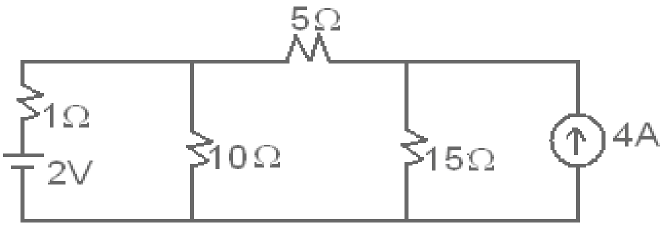

Figure 2:

ii. efficiency at half load. [7+8]

7. The rotor of a 3-phase induction motor has 0.04 Ω resistances per phase and 0.2 Ω stand still reactance per phase. What external resistance is required in the rotor circuit in order to get half of the maximum torque at starting? Neglect stator impedance. By what percentage will this external resistance change the current and pf at starting? [15]

8. An inductive coil having a resistance of 5 ohms, and a self-inductance of 0.06 henry is connected to a 200 V, 50 Hz mains. Estimate the current taken, and its power factors. Find also what value of capacitance must be arranged in series with it to give 2,000V across the capacitor with minimum applied p.d. Estimate the necessary p.d. and also the p.d across the inductive coil. [15]

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1. (a) A rectangular metal strip has the dimensions x = 10cm, y = 0.5cm and z = 0.2cm. Determine the ratio of the resistance R_x, R_y, R_z between the respective pairs of opposite faces.
   (b) Calculate the resistance of a copper tube of 0.5 cm thick and 2 m long. The external diameter is 10 cm. Given that resistance of copper wire of 1m long and 1 mm^2 in cross-section is 1/58 ohm. [7+8]

2. (a) Explain the effect of slip on the rotor circuit.
   (b) A 6-pole induction motor operates on a supply whose frequency is 50 Hz. Calculate
      i. the speed at which the magnetic field of the stator is rotating,
      ii. the speed of the rotor when the slip is 4%,
      iii. the frequency of the rotor currents when the slip is 5%, and
      iv. the frequency of the rotor currents at standstill. [6+9]

3. (a) What are the various types of Ammeters and voltmeters?
   (b) Prove that deflecting torque is Proportional to the Square of the current in attraction type M I instruments. [15]

4. (a) State and explain Thevenin's theorem.
   (b) For the below circuit in figure 3 obtain Thevenin's equivalent across ab terminals. [6+9]

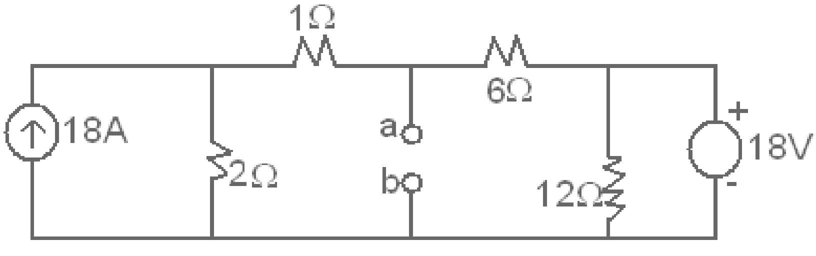

Figure 3:

5. (a) Name the main parts of a D.C. Machine and state the materials of which each part is made.

(b) A shunt generator delivers 450 A at 230V and the resistances of the shunt field and armature is 50Ω and 0.03Ω respectively. Calculate the generated e.m.f. [15]

6. (a) The design requirement of a 11,000 / 415 V, 50 Hz, single phase, core-type transformer are approximate emf/ turn is 15 V, maximum flux density 1.5 T. Find a suitable number of primary, and secondary turns and the net cross-sectional area of the core.

   (b) Explain different losses in case of transformer. [8+7]

7. (a) Draw the power flow diagram of a DC shunt motor and also explain the following terms

      i. Electrical Efficiency,
      ii. Mechanical Efficiency and
      iii. Commercial Efficiency.

   (b) A 220V, shunt motor on, no load runs at 750rpm and draws a 5A from supply. The armature and field resistance are 0.10ohms and 220ohms respectively. Calculate the speed, when loaded and drawing full load current of 100A from the supply if the armature reaction weakens the field flux by 4%. [7+8]

8. Find the active and reactive components of the current taken by a series circuit consisting of a coil of inductance 0.1 H and resistance 8 Ω and a capacitor of 120 μF connected to a 240 V, 50 Hz supply? [15]

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1. (a) Discuss the Significance of back EMF
   (b) A 230V motor has an armature circuit resistance of 0.8Ω. If the full load armature current is 25A and the no load armature current is 6A. Find the change in back e.m.f from no-load to full-load. [6+9]

2. (a) Sketch and describe the construction of a moving coil ammeter and give the principle of operation.
   (b) What are the advantages and limitations of a moving iron instrument? [7+8]

3. (a) Calculate the resistance of 915 meters length of a wire having a uniform cross-sectional area of 0.77cm^2 if the wire is made of copper having a resistivity of 1.7×10^{-6} ohm cm.
   (b) A wire of double 1 m has a resistance of 2 ohms. What is the resistance of second wire, whose specific resistance is double the first, if the length of wire is 3 meters and the diameter is double of the first? [7+8]

4. (a) An alternative voltage of (160 +j120)V is applied to a circuit and the current in the circuit is given by 6+j8 A. Find :
      i. the values of elements of the circuit;
      ii. the power factor of the circuit;
      iii. power consumed?
   (b) A choking coil of negligible resistance takes a current of 3.2A, when connected to 200V, 50Hz supply, Calculate
      i. inductance, and
      ii. the current taken by the coil, if the frequency is reduced to 20Hz? [8+7]

5. (a) Describe how the rotating magnetic field is produced in 3-Phase winding induction motor
   (b) A 3-phase slip ring induction motor with star connected rotor has an induced emf of 60 V between the slip rings at standstill with normal voltage applied to the stator. The rotor winding has a resistance per phase of 0.5 ohms and standstill reactance per phase of 3 ohm. Calculate the slip and rotor current per phase when the rotor is developing maximum torque. [7+8]

6. (a) Explain the compound DC generator with neat circuit diagram.

(b) The armature of a 4-pole wave wound d.c generator is required to generate an e.m.f of 480V on open circuit when revolving at a speed of 620 rpm. Calculate the magnetic flux per pole required. The armature has 160 slots with 2 coil sides per slot and each coil consisting of three turns. The armature is wave-wound. [15]

7. A 220/440 V, 10 KVA , 50 Hz single-phase transformer has at full-load, a copper loss of 120 W. If it has an efficiency of 98% at full-load and unity p.f determine the iron losses. What would be the efficiency at half full-load, and 0.8 p.f lagging? [15]

8. (a) Using Super position theorem find V in the circuit shown in figure 4.

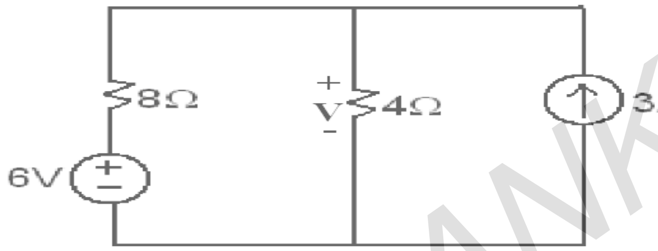

Figure 4:

(b) Three lamps are connected in parallel to a 200V supply. Two of the lamp currents are I_1=2A and I_2=3A. If the total supply current is 9A, calculate the resistance of each of the three lamps shown in figure 5. [7+8]

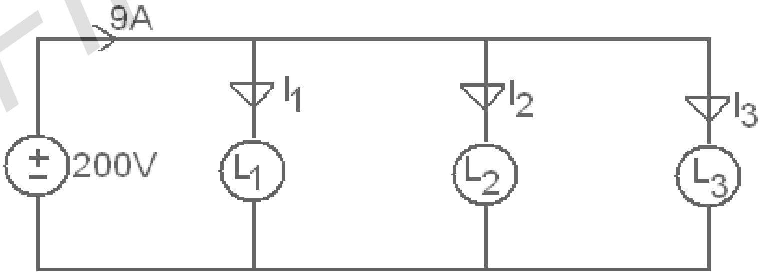

Figure 5:

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