Code No: R09220401 **R09** **Set No. 2**

II B.Tech II Semester Examinations,April/May 2012
PRINCIPLES OF ELECTRICAL ENGINEERING
Common to Chemical Engineering, Electronics And Telematics, Electronics And Communication Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain about various types of capacitor motors?
   (b) Explain the applications of Synchros. [10+5]

2. Explain m-derived low-pass T-section and π-section in detail and the necessary design procedure. [15]

3. (a) From the fundamentals, derive the expression for the EMF equation of a single phase transformer.
   (b) A 40 KVA, single phase transformer has 400 turns on the primary and 100 turns on the secondary. The primary is connected to 2000V, 50 Hz supply. Determine:
      i. The secondary voltage and
      ii. The maximum value of flux. [7+8]

4. (a) Define- Reciprocal and Symmetrical Networks.
   (b) What is the condition for the given network to be reciprocal as well as Symmetrical in terms of ABCD parameters.
   (c) Find the ABCD parameters for network shown in Figure 1. [5+5+5]

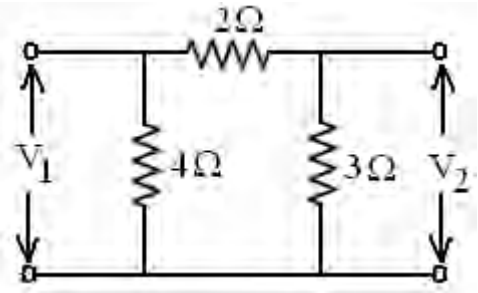

Figure 1:

5. (a) Name the main parts of a DC machine and state the materials of which each part is made of and explain clearly the reasons to select these materials.
   (b) A Certain wave wound DC generator running at a speed of 300rpm is to generate an induced emf of about 535V, the flux per pole being 0.055 Wb. Determine the number of poles, if the number of conductors is 650. [9+6]

6. In a series RL circuit with R = 3 ohm and L = 1 H, a DC voltage of E = 50 V is applied at t = 0. Find the transient response of current and plot the response. [15]

7. (a) Explain why Swinburnes test cannot be used to determine the efficiency of DC series motor?

   (b) A 4 pole series motor has 944 wave-connected armature conductors at a certain load. The flux per pole is 34.6 mWb and the total mechanical torque developed is 209 N-m. Calculate the line current taken by the motor and the speed at which it will run. The applied voltage is 500 V and total motor resistance is 3Ω. [7+8]

8. An attenuator is composed of symmetrical T-section having series arm each of 420 ohms and shunt arm of 740 ohms. Derive expression for and calculate the characteristic impedance of this network and attenuation per section. Draw the circuit diagram for symmetrical T-type attenuator. [15]

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1. (a) Explain symmetrical π-type attenuator with necessary equations in detail.
   (b) Design a symmetrical π-type attenuator to give 20 db attenuation and to have a characteristic impedance of 200 ohms. [10+5]

2. (a) What is a DC generator? Explain its constructional details.
   (b) Draw the circuit model of a DC shunt generator and write the relationship of currents and voltages. [5+10]

3. Discuss why single phase induction motor is not self starting? Explain different techniques for starting of 1-Φ induction motor. [15]

4. (a) What is regulation? How can it be obtained from equivalent circuit parameters?
   (b) The readings obtained from tests on 10 KVA, 450/120V, 50Hz transformer are
   O.C. Test (LV Side) : 120V,4.2A, 80W
   S.C. Test (HV Side): 9.65V,22.2A,120W
   Compute:
      i. The equivalent circuit constants.
      ii. The efficiency at half load and 80% lagging power factor. [7+8]

5. (a) Obtain the current i(t) for t$\geq$0 for the network shown in Figure 2.

   (b) What are the initial conditions? Why are they needed? Explain. [8+7]

6. Obtain the input and output impedances of an amplifier having $h_{11} = 2$ ohm; $h_{12} = 1$; $h_{21} = 5$; $h_{22} = 2$ mho,if it is driven by a source having an internal resistance of 4 ohm and is terminated through a load which draws maximum power from the amplifier. [15]

7. (a) "All general requirements of the electric traction are fulfiled by DC series motors compared to other DC motors". Justify with related equations and characteristics.
   (b) A 250V, 4-pole wave wound DC series motor has 888 conductors on its armature. It has armature and field resistance of 0.88ohms .The motor takes a current of 80A. Determine
   i) Speed
   ii) Gross torque developed if it has a flux per pole of 28 mwb. [7+8]

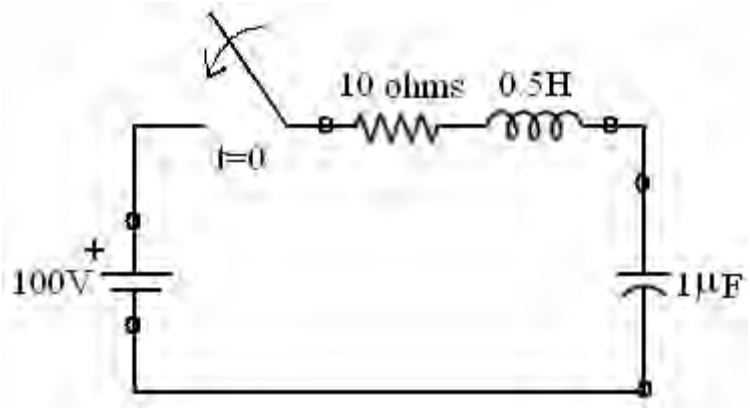

Figure 2:

8. Derive the expression for symmetrical T and π filter networks. [15]

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1. Explain the concept of split-phase induction motor along with its characteristics. [15]

2. Compare DC generator and DC motor from principle of operation point of view and mention the application of each machine? [15]

3. What is an Attenuator? Explain different types of symmetrical attenuators in detail? [15]

4. Determine the Z and Y- parameters of the network shown in Figure 3. [15]

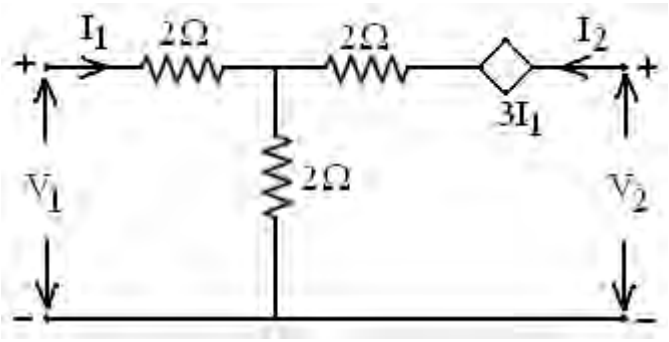

Figure 3:

5. (a) A series wound motor runs normally. The field coils are all connected in series. Estimate the speed and current taken by the motor, if the coils are reconnected in two parallel groups of two in series. The load torque increases as the square of the speed. Assume that flux is directly proportional to the current and ignore the losses.

   (b) A 220V motor has an armature circuit resistance of 0.6Ω. If the full load armature current is 20A and the no load armature current is 5A, find the change in back e.m.f from no-load to full-load. [6+9]

6. (a) In the circuit shown in Figure 4, the switch is closed on the position 1 at t = 0 there by applying a D.C. voltage of 100V to series R-L circuit. At t = 500μsec, the switch is moved to position 2. Obtain the expression for current i(t) in the both intervals sketch i(t).

   (b) The switch S is closed at t = 0 (Figure 5). Find the initial conditions at t = 0^+ for i_1, i_2, V_c, di_1/dt, di_2/dt. [8+7]

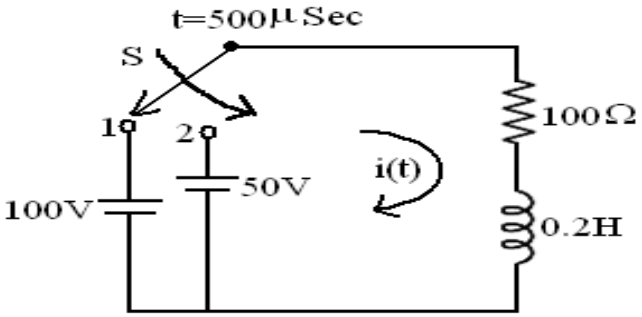

Figure 4:

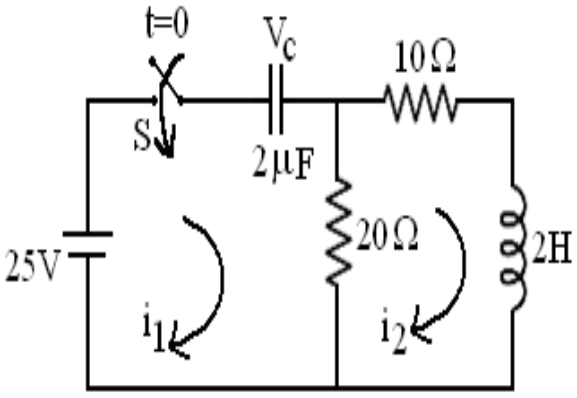

Figure 5:

7. (a) What are the different losses in a transformer? Derive the condition for maximum efficiency of a single phase transformer.

   (b) The primary and secondary winding resistances of a 30 KVA, 6600/250 V , 1-phase transformer are 8 ohm and 0.015 ohm respectively. The equivalent leakage reactance as referred to the primary winding is 30 Ohm. Find the full load regulation for load power factors of:

   i. Unity,

   ii. 0.8 lagging and

   iii. 0.8 leading. [7+8]

8. (a) Derive the necessary expressions for m-derived low pass filter.

   (b) Derive the necessary expression for m-derived high pass filter. [7+8]

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Answer any FIVE Questions
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1. (a) With a neat sketch, explain how the direction of rotation of DC motor can be reversed?
   (b) Derive the standard torque equation of DC motor from first principles. [8+7]
2. Derive the expression for i(t) of RC series circuit with zero initial conditions and show the variation of i with time t . [15]
3. (a) What is transformer regulation? How it can be obtained from equivalent circuit parameters?
   (b) The primary and secondary resistance of a 1100/220 V transformer are 0.3 ohm and 0.02 ohm respectively. If iron loss amounts to 260 W, determine the secondary current at which the maximum efficiency occurs and the maximum efficiency at 0.8 power factor. [7+8]
4. What is a half section? What is its main characteristics? Why it is used? Derive expression for impedances as seen from the two-ports of an m-derived half section. [15]
5. Derive the relationship between Y-parameters and Z-parameters. [15]
6. What are Synchros and explain the constructional features and classifications of Synchros. [15]
7. Describe all types of DC generators in detail. [15]
8. (a) Design a T-type attenuator to have an attenuation of 40db and to work between source impedance of 400 ohms and load impedance of 900 ohms.
   (b) Design a π-type attenuator to have an attenuation of 25db and to work between source impedance of 600 ohms and load impedance of 1000 ohms. [7+8]

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