Code No: A109211001 **R09** **Set No. 2**

II B.Tech I Semester Examinations,May/June 2012
FUNDAMENTALS OF ELECTRICAL ENGINEERING
Common to Bio-Medical Engineering, Instrumentation And Control Engineering, Electronics And Computer Engineering, Electronics And Instrumentation Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Show that in a series RLC circuit, the resonant frequency is the geometric mean of half power frequencies. [15]

2. (a) Explain the unbalanced delta connected load with neat circuit diagrams.
   (b) The unbalanced star connected load has balanced voltages of 200V and the load impedances are Z_a = (1+j4) ohms, Z_b = (3-j4) ohms and Z_C = (6+j10) ohms. Calculate the line currents and the neutral current. Assume ABC sequence. [7+8]

3. (a) Derive the expression for rotor current frequency in induction motor.
   (b) A three-phase induction motor is wound for four poles and is supplied from a 50-Hz supply. Calculate
      i. the synchronous speed.
      ii. the speed of the rotor when the slip is 3%.
      iii. the rotor frequency when the speed of the rotor is 900 rpm. [6+9]

4. Find the power across the two current sources in the network shown in figure 1 using superposition theorem. [15]

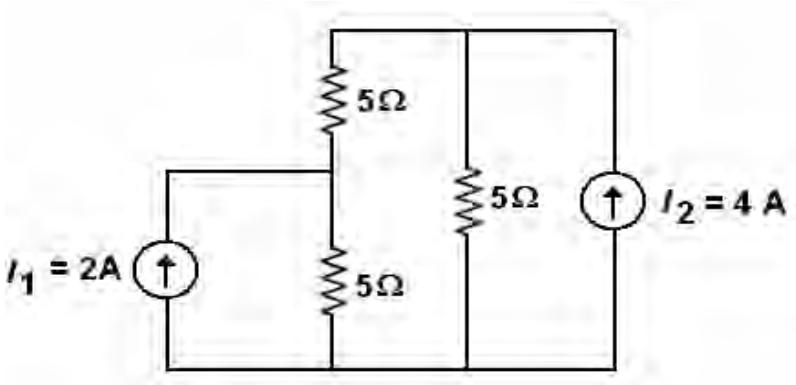

Figure 1:

5. (a) Explain the construction of stator of synchronous generator.

(b) A 3-phase, 50Hz, 20 pole salient pole alternator with star connected stator winding has 180 slots on the stator. Each slot consists of 8 conductors. The flux per pole is 25 mWb and is sinusoidally distributed. The coils are full pitched. Calculate the generated voltage. [6+9]

6. A current of 0.5A is supplied by a source to an inductor of 1H.

   (a) Calculate the energy stored in the inductor.

   (b) What happens to the stored energy if source is short circuited? [15]

7. A 15mH coil is connected in series with another coil. The total inductance is 70mH. Find the inductance of the second coil, mutual inductance and coefficient of coupling. Derive the expresion used. [15]

8. Describe the constructional details of DC machine. [15]

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Code No: A109211001 **R09** **Set No. 4**

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Common to Bio-Medical Engineering, Instrumentation And Control Engineering, Electronics And Computer Engineering, Electronics And Instrumentation Engineering

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1. Obtain the expression for average value, form faactor and peak factor for sinusoidal wave. [15]
2. Explain self excited DC generator characteristics with neat diagrams. [15]
3. Calculate the change in current of the network given below in figure 2, using compensation theorem when load resistor changes to 10 ohms. [15]

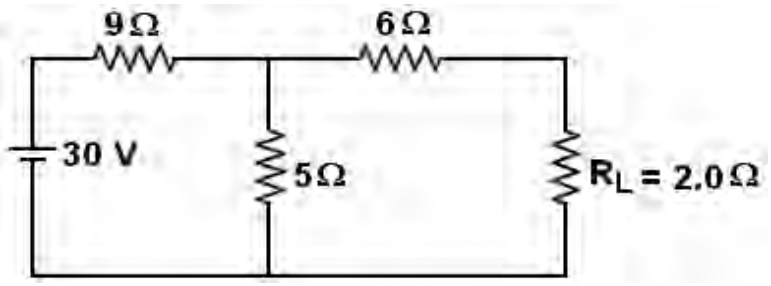

Figure 2:

4. Write down the loop equations for the coupled network shown in figure 3. [15]

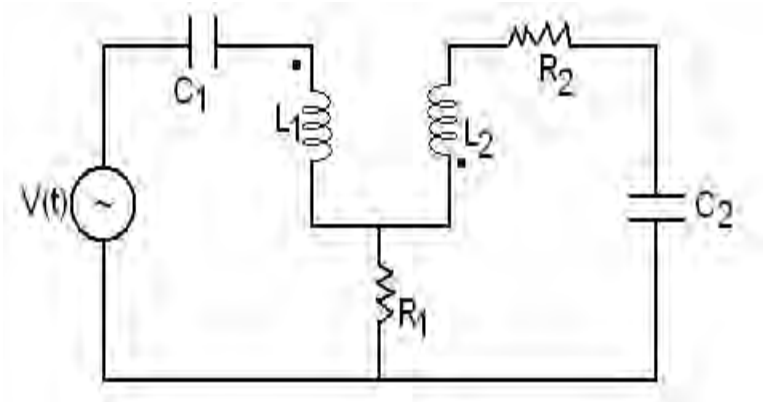

Figure 3:

5. (a) Define coil span factors and breadth factors as applied to the alternator and state the advantages of short pitching.

(b) A 1000kVA, 3300 V, 50Hz, 3-phase star connected alternator has 0.2Ω resistance when measured between any two stator terminals. Effective resistance is 1.5 times the dc resistance. Synchronous reactance per phase is 4Ω. Calculate the full load regulation of the alternator at

i. 0.8 lagging

ii. 0.8 leading. [7+8]

6. (a) Explain the power measurement by three phase circuit using two wattmeter method with neat circuit diagram.

(b) $Z_1 = 15\angle -30^0, Z_2 = 20\angle 80^0$ *and* $Z_3 = 10\angle 90^0$ ohms are the impedances connected in the form of delta and the supply voltage is 415V. Assume the RYB sequence and find the phase currents, line currents and the total power absorbed. [7+8]

7. (a) What is meant by synchronous speed? Explain why the speed of the induction motor is never equal to the synchronous speed?

(b) A single phase, 50Hz, 2.5kVA, 400/230V transformer has the following parameters referred to H.V.side: $R_{01} = 4\Omega$ and $X_{01} = 5\Omega$.
Determine the regulation of transformer when operating at

i. full load with 0.75 pf lagging

ii. full load with 0.8 p.f leading [7+8]

8. Explain about inductance and capacitances parameters and find the equivalent inducatance and capacitance when they are connected in series and parallel? [15]

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Code No: A109211001 **R09** **Set No. 1**

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

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1. (a) Describe the actual transformer on no-load with necessary diagrams.
   (b) A single phase, 50Hz, 2.5kVA, 415/240V transformer has the following parameters referred to H.V. side:
   Determine the regulation of transformer when operating at
   i. full load with 0.8 pf lagging
   ii. full load with 0.8 p.f leading. [6+9]

2. Using nodal analysis, determine the power suplied by 8V voltage source in (figure 4). [15]

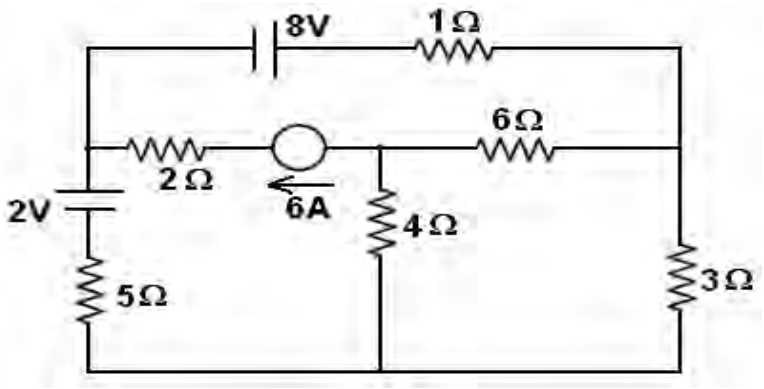

Figure 4:

3. An iron ring has a mean diameter of 25 cm and area of cross section of 5cm^2 and is wound with a coil of 1000 turns. Determine the current in the coil to establish a flux density of 0.8Wb/m^2 in the ring. Take the relative permeability of iron as 500. In case of an air gap of 2mm is cut in the ring, what would be the current in the coil to establish same flux density. [15]

4. In a series RLC circuit if the applied voltage is 10V and resonance frequency is 1 kHz and Q factor is 10, what is the maximum voltage across the inductor? Derive the necessary equation. [15]

5. (a) State and explain Thevenin's theorem.
   (b) Find the voltage across A and B terminals in the circuit shown below in figure 5. [7+8]

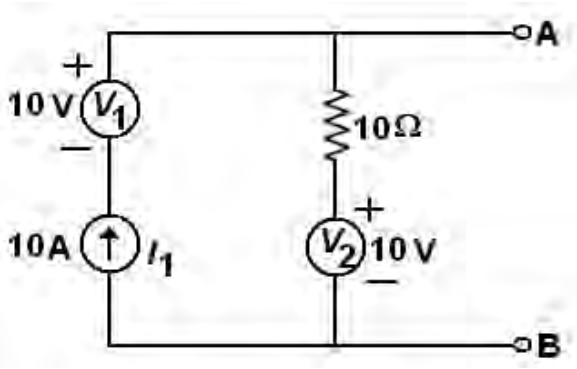

Figure 5:

6. (a) Explain the three phase, 4-wire star connected system with neat circuit diagram.

   (b)A delta connected load has impedances as$Z_1 = 10\angle 30^0\Omega, Z_2 = 25\angle 0^0\Omega, Z_3 = 20\angle -30^0\Omega$ and the supply is 500V. Assume the sequence to be RYB. Find line currents and total active and reactive powers. [6+9]

7. A 3-phase, 50Hz, star connected, 2000kVA, 2300V alternator gives a short circuit current of 600A for a certain field excitation. With the same excitation, the OC voltage was 900V, the resistance between a pair of terminal was 0.12Ω. Find full load regulation at

   (a) UPF

   (b) 0.8pf lagging

   (c) 0.8 pf leading, and draw phasor diagrams [15]

8. A separately excited generator running at 1500 rpm supplies 225A at 120V to a current of constant resistance. What will be the current when the speed is dropped to 1000 rpm with the field current unaltered? The armature resistance is 0.06Ω and the total drop at the brushes is 1.5V. Ignore armature reaction. [15]

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Code No: A109211001 **R09** **Set No. 3**

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Describe the rotor slip and torque-slip characteristics of single phase induction motor.
   (b) A 100 KVA, 3000-V, 50-Hz, 3-phase star connected alternator has effective armature resistance of 0.2 ohms. The field current of 40A produces short circuit current of 200A and an open circuit emf of 1100 V (line value). Calculate the full load voltage regulation at 0.8 p.f lag. [7+8]

2. In the circuit shown in figure 6, find the voltage between the terminals A and B, if the current change at the rate of 100A/sec. The values of L_1, L_2 and M are 1H,2H and 0.5H respectively. [15]

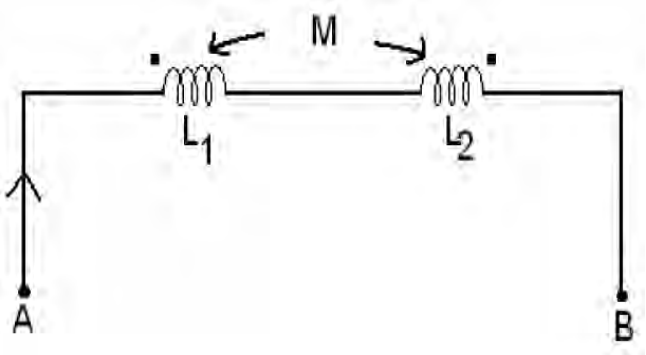

Figure 6:

3. A 3 - Φ, 6 pole, 50Hz cage motor is running with a slip of 4%. Find
   (a) Speed of rotating field relative to stator winding
   (b) Motor speed
   (c) slip speed
   (d) Frequency of the emf induced in the rotor
   (e) Speed of rotation of rotor mmf relative to rotor winding
   (f) Speed of rotor of rotor mmf relative to stator winding. [15]

4. Determine the voltage across 8 ohms resistor for the following network shown in figure 7, using superposition theorem. [15]

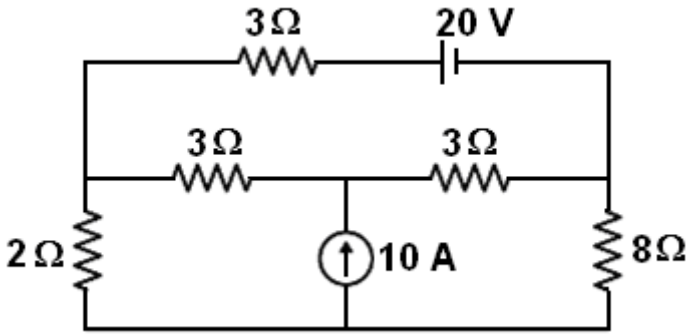

Figure 7:

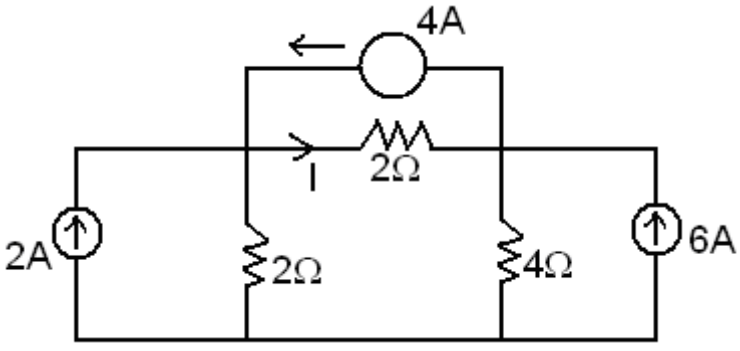

Figure 8:

5. Using nodal analysis, find the current I in the circuit shown in figure 8. [15]

6. Explain about the response of a resistor to sinusoidal excitation. [15]

7. (a) What are the classifications of DC generators and explain separately excited generator with circuit diagram.

   (b) A D.C. generator develops an e.m.f of 200V when driven at 900 rpm with a flux per pole of 0.04 Wb. It is desired that this e.m.f. be increased to 250V at 1000 rpm. What should be the value of the flux per pole under the new circumstances? [7+8]

8. (a) What are the merits of star and delta connected systems.

   (b)A delta connected load has impedances as$Z_1 = 12\angle 30^0\Omega$, $Z_2 = 20\angle 0^0\Omega$, $Z_3 = 32\angle -30^0\Omega$ and the supply is 440V. Assume the sequence to be RYB. Find line currents and the total power. [6+9]

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