Code No: A109210801 **R09** **Set No. 2**

II B.Tech I Semester Examinations,November 2010
ELECTRICAL ENGINEERING
Common to Chemical Engineering, Mechatronics, Metallurgy And Material Technology

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Write brief notes on:
   (a) Pitch factor
   (b) Distribution factor
   (c) Regultion & Altemater. [15]

2. Explain the classification of moving iron instruments. [15]

3. A 6600/400V, single phase, 600 KVA transformer has 1200 primary turns. Find:
   (a) transformation ratio
   (b) secondary turns
   (c) voltage / turn
   (d) secondary current when it supplies a load of 400KW at 0.8 pf lagging. [15]

4. (a) Why the rotor of a three phase induction motor is set into rotation?
   (b) A 3-ϕ induction motor has 2 poles and is connected to 400V, 50 Hz supply. Calculate the actual rotor speed and rotor frequency when the slip is 4%.[15]

5. Explain the speed control methods of a DC shunt and series motors with the help of neat circuits and also mention the limitations of each method. [15]

6. (a) Derive an expression for the force on a current carrying conductor placed in a uniform magnetic field.
   (b) An air cored toroidal coil has 450 turns, 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 Amperes is reversed in 60 milliseconds. [15]

7. (a) Explain the reasons for compounding DC generators. Describe the external characteristics of DC compound generators.
   (b) A 6 pole, 12 Kwatt,230 volt DC machine is wave connected. If the machine is now lap connected, all other things remaining the same, calculate the voltage and current ratings of the machine. [15]

8. (a) Three non inductive loads 10 Kwatts, 8 Kwatts and 6 Kwatts are connected between the three lines and neutral of a 3 - phase star connected system with a line voltage of 400 volts, 50 Hz. Calculate the current in each line and neutral.

(b) A balanced three phase star connected load of 120 Kwatts draws a leading current of 60 Amperes from the supply mains when connected to a 3-phase 1200 V, 50 Hz AC mains. Find the load circuit constants per phase. [15]

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

Answer any FIVE Questions
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1. (a) Discuss the reasons to wind the field coils of a DC shunt generator with a large number of turns of thin wire.
   (b) A 4 pole DC generator has 564 conductors on its armature and is driven at 800 RPM. The flux per pole being 20 milli weber and the current in each conductor is 60 Amperes. Calculate the:
      i. total current
      ii. generated e.m.f
      iii. power generated in the armature if the armature is lap connected and wave connected. [15]

2. Define efficiency and the regulation of a transformer. Explain how power factor affects both of them? [15]

3. (a) What is an alternator? What is its operating principle?
   (b) How are alternators classified? Explain. [15]

4. (a) A circuit of resistance 20 ohms and inductive reactance 15 ohms is connected in parallel with another circuit which contains resistance of 20 ohms in series with a capacitive reactance of 20 ohms. This combination is energized from a 200V, 50 Hz supply. Determine the value of capacitance to be connected in parallel to improve the power factor of this circuit to unity.
   (b) An inductive coil having resistance of 20 ohms and inductive reactance of 40 ohms is connected in parallel with a capacitive reactance of 48 ohms. This combination is energized from a 200 V, 50 Hz AC supply. Find the total current drawn by the circuit and its power factor. [15]

5. (a) A 3-ϕ, 50 Hz induction motor has 8 poles. If full load slip is 2.5%, determine:
      i. synchronous speed
      ii. rotor speed
      iii. rotor frequency
   (b) The frequency of emf in the stator of a 4-pole, 3-ϕ induction motor is 50Hz and that in the rotor is 1.5 Hz. Determine:
      i. slip
      ii. speed of the motor. [15]

6. (a) A coil of 60 turns having a mean diameter of 3 cm is placed coaxially at the centre of a Solenoid of 80 cm long wound with 2500 turns and carrying a current of 2 Ampere. Determine the mutual inductance of the arrangement.

   (b) Obtain the equivalent resistance between the point A and N in the circuit shown in Figure 6b. [15]

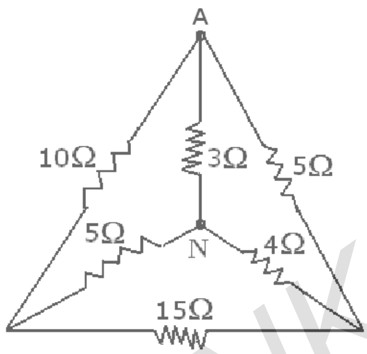

Figure 6b

7. A weight of 5 grams is used as the controlling weight in a gravity controlled instrument. Find its distance from spindle if the deflecting torque corresponding to a deflection of 60^0 is 1.13×10^{-3} Nm. [15]

8. A 400 Volt DC Shunt motor when running on no-load draws a current of 4.8 amperes. The armature resistance and shunt field resistance are 0.5 ohms and 200 ohms respectively. Find the output and efficiency of the machine when running as a generator on full load and taking a current of 45 Amperes. [15]

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Code No: A109210801 **R09** **Set No. 1**

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Time: 3 hours Max Marks: 75

Answer any FIVE Questions
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1. Describe the different methods of producing controlling torque in analog indicating instruments and list their advantages and disadvantages. [15]

2. (a) Derive an expression for the torque of an induction motor and obtain the condition for maximum torque.
   (b) Explain slip-torque characteristics of an induction motor. [15]

3. (a) How do we classify the characteristics of a DC motors. Draw and explain the various characteristic curves of a DC series motor.
   (b) A DC shunt motor rated 50 Kwatts having armature resistance of 0.25 ohms and shunt field resistance of 130 ohms is connected to 250 volts supply is loaded to draw a current of 200 Amperes when running at a speed of 1200 RPM. Determine the load torque and motor efficiency if the rotational losses are 500 watts. [15]

4. (a) Two coils are placed side by side. Their combined inductance when connected in series is 1 .0 H and 0.4 H depending on the relative directions of the current in the coils. Calculate the mutual inductance between the coils. If the self inductance of one coil when isolated is 0.3 H, find the self inductance of other coil.
   (b) Two coils having 100 and 200 turns respectively wound side by side on a cross closed iron core of section 150 cm^2 and mean length of 300 cm. Determine the mutual inductance between the coils and the induced e.m.f in the second coil if the current changes from Zero to 12 Amperes in the first coil in 0.02 seconds. Relative permeability of iron is 2200. [15]

5. (a) What is resonance? Derive the equation for resonant frequency?
   (b) Explain the method to obtain the line and phase voltage relationships in three phase star connected system. [15]

6. (a) Why are the Carbon or Graphite brushes preferred over copper brushes in DC machines?
   (b) Calculate the flux per pole required for a 4 pole generator with 360 armature conductors generating a voltage of 250 volts at 1000 RPM when the armature is connected to:
      i. lap wound and

ii. wave wound. [15]

7. A 50 KVA, single phase transformer has an iron loss of 400W and full load copper loss of 800W.

   (a) find the load at which maximum efficiency occurs and the value of maximum efficiency at unity power factor.

   (b) if the maximum efficiency occurs at 80% of full load, find the new core loss and full load copper loss assuming that total full load loss is constant. [15]

8. The following test results are obtained from a 3- ϕ 6,000 KVA, 6600 V, star- connected, 2-pole, 50 Hz turbo-alternator: with a field current of 125 A, the open-circuited voltage is 800 A. At the rated full load, the resistance drop is 3%. Find the regulation of the alternator on full load and at a power factor of 0.8 lagging. [15]

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Code No: A109210801 **R09** **Set No. 3**

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

Answer any FIVE Questions
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1. The sine waves are represented by the expressions.
   e = 280 sin(314wt - $\pi/6$)
   i = 40 sin(314wt + $\pi/4$)
   Find the Maximum and RMS values for these waveforms. Also find the phase difference between the two waveforms. [15]

2. Bring out the differences between moving coil and moving iron instruments. [15]

3. Explain OC and SC tests of 1- ϕ transformer and discuss their advantages. [15]

4. (a) Derive an expression for the frequency of rotor currents of three phase induction motor.
   (b) A 4 pole, 3-ϕ induction motor is run at 1450 rpm from a 50 Hz supply system. Calculate the percentage slip and frequency of rotor currents. [15]

5. (a) What is an alternator? Write advantages of stationary armature.
   (b) Write short notes on salient pole type alternator. [15]

6. (a) Which part of the DC machine offers iron losses? How do you minimize them.
   (b) Draw the Speed - Torque characteristics of differential compound and Cumulative compound motors. [15]

7. (a) Obtain the equivalent resistance between the terminals A and B in the circuit shown in Figure 7a.

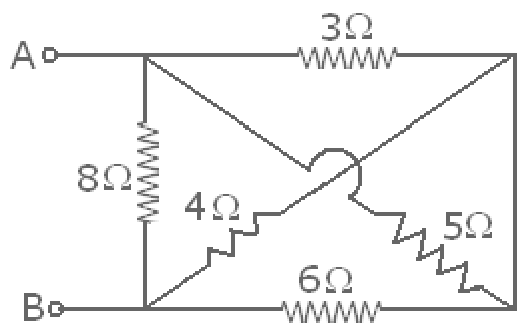

Figure 7a

   (b) Discuss the Dot convention and mutual induction between the inductive coils. [15]

8. (a) Do we use laminations for all iron parts of a DC machine? If not, why?
   (b) Which losses are fixed and which losses vary with load in a DC series generator?
   (c) A 4 pole lap wound armature has 144 slots with two coil sides per slot, each coil is having two turns. If the flux per pole is 20 mwb and the armature rotates at 720 RPM, what is the induced e.m.f? [15]

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