Code No: RR210303 **Set No.1**

II B.Tech. I Semester Supplementary Examinations, May -2005
ELECTRICAL ENGINEERING
(Common to Mechanical Engineering, Chemical Engineering, Mechatronics, Metallurgy & Material Technology and Production Engineering)
Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Write short notes on"magnetic leakage and FRINGING".
   (b) An electro-magnet has an gap of 4 mm and flux density in the air gap is 1.3 wb/m^2. Determine the ampere-turns for the gap.
2. (a) Why the inter connection is needed in 3-phase system? Explain about phase sequence.
   (b) Three similar coils, each. having a resistance of 20Ω and an inductance of 0.05H all connected in
      i. star
      ii. mesh to a 3-phase, 50Hz supply with 400V between lines. Calculate the total power absorbed and the line current in each case. Draw the vector diagram of current and voltages in each case.
3. (a) Explain the classification of d.c generators with neat diagrams and corresponding voltage equations for each.
   (b) A 250V short shunt compound generator is delivering 80A. The armature, series and Shunt field resistances are 0.05, 0.03, and 100 ohms respectively. Calculate the voltage induced allowing a brush drop of 2V.
4. (a) Derive an expression for the torque developed in N-m and in Kf-m in a dc motor.
   (b) Determine the value of torque in Kg-m developed by the armature of a 6-pole wave-wound motor having 492 conductors, 30mwb per pole when the total armature current is 40A.
5. (a) Explain the construction, and working principle of single phase transformer
   (b) The efficiency of a 500 KV A, single phase transformer is 98%, when delivering full -load at 0.8 p.f., leading and 99% at Half-full-load at unity power factor, calculate.
      i. Iron losses
      ii. Full load copper losses
6. (a) How do you classify the induction motors. Give the constructional details of them.
   (b) Define slip and give an account of the quantities which vary with slip.

7. (a) Explain Pessimistic method of finding regulation of a given alternator.
   (b) The effective resistance of a 2200V, 50Hz, 440KVA, 1-phase alternator is 0.5 Ohms. On short circuit a field current of 40 Amps gives the full load current of 200Amps. The EMF on open circuit with the same field excitation is 1160V. Calculate
      i. Synchronous impedance
      ii. Synchronous reactance
      iii. % regulation at 0.707 PF leading

8. A wattmeter has its current coil connected in the yellow line and its voltage circuit is connected between the red and blue lines. The line voltage is 415V and the balanced load takes a line current of 30A at a power factor of 0.7 lagging. Draw circuit and phasor diagrams and derive an expression for the reading on the wattmeter in terms of the line voltage and current and of the phase difference between the phase voltage and current. Calculate the value of the wattmeter indication.

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1. Two inductances of 15 mH and 25 mH are converted in series such that their fluxes oppose each other. They are so placed that the coefficient of coupling is 0.8. Calculate the total inductance of series combination.

2. (a) Define Root mean square value, Average value.
   (b) For the sinusoidal wave calculate R.M.S., Average Values.

3. (a) Briefly explain the principle of operation of a d.c. generator.
   (b) Calculate the flux in a 6 pole d.c. generator with 780 armature conductors, generating 500V, when running at 1000rpm if the armature is
      i. lap wound
      ii. wave wound.
   (c) Calculate the emf generated by a 6 pole wave wound armature having 45 slots with 18 conductors. The flux/pole is 0.025Wb. The armature is driven at 1000rpm.

4. (a) Explain the necessity of a starter to the motor.
   (b) A 220V shunt motor has an armature resistance of 0.5V. The armature current at starting must not exceed 40A. If the number of sections is 6, calculate th values of the resistor steps to be used in this starter.

5. (a) Explain the principle of operation of a 1- phase transformer
   (b) A single phase transformer has 400 primary and 1000 secondary turns. The net constructional area of the core is 60 cm^2. If the primary winding is connected to a 50Hz supply at 520V. Calculate
      i. Peak value of flux density in the core.
      ii. Voltage induced in the secondary winding.
      iii. Transformation ratio.
      iv. EMF induced per turn in both the windings.

6. (a) Explain the principle of operation of a 3 phase induction motor.
   (b) A 3 phase, 4 pole, delta connected induction motor has a full load slip of 5%. If the supply frequency is 50Hz, find the full load speed, synchronous speed and rotor frequency.

7. (a) Explain Pessimistic method of finding regulation of a given alternator.

   (b) The effective resistance of a 2200V, 50Hz, 440KVA, 1-phase alternator is 0.5 Ohms. On short circuit a field current of 40 Amps gives the full load current of 200Amps. The EMF on open circuit with the same field excitation is 1160V. Calculate

      i. Synchronous impedance

      ii. Synchronous reactance

      iii. % regulation at 0.707 PF leading

8. (a) If, in a laboratory you were required to measure the total power taken by a three-phase balanced load, show how to do this, using two wattmeters. Explain the principles of the method. Draw the phasor diagram for balanced load case with a lagging power factor and use this to explain why the two wattmeter readings differ.

   (b) The load taken by a three phase induction motor was measured by the two-wattmeter method and the readings were 860W and 240W. What is the active power taken by the motor and at what power factor is it working?

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Code No: RR210303 **Set No.3**

II B.Tech. I Semester Supplementary Examinations, May -2005
ELECTRICAL ENGINEERING
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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1. Two coils having self inductances are 0.9H and 0.4H.their mutual Inductance is 0.3H. Find the Equivalent Inductance when both are magnetized in
   (a) same direction
   (b) opposite direction. Derive the formula used.

2. (a) How 3-phase voltages are generated? Explain briefly.
   (b) A 3-ϕ, Δ connected alternator drives a balanced 3-ϕ load whose each phase current is l0A in magnitude. At the time when $I_a = 10 \angle 30^o$. Determine the following for a phase sequence of abc.
      i. Polar expression for I_a, I_b and I_c
      ii. Polar expression for the three line currents. Show the phase and line currents n a phasor diagram.

3. (a) With neat sketches, explain the construction and functions of the various parts of a d.c. machine.
   (b) Calculate the emf generated by a 6 pole lap wound armature with 65 slots and 12 conductors per slot, when driven at 1000 rpm. The flux/pole is 0.02 Wb.

4. (a) Give the voltae equation and power equation of a dc motor.
   (b) A 20KW, 250V dc shunt generator has armature and field resistances of 0.1 Ω and 125 Ω respectively. Calculate the total armature power developed when running
      i. as generator delivering 20 KW output.
      ii. as a motor taking 20 KW input

5. (a) On what factors the induced EMF in the transformer windings depends. Justify the answer with appropriate derivation.
   (b) A double wound 1- phase transformer is required to step down from 1900V to 240V, 50Hz . It is to have 1.5V per turn . Calculate the required number of turns on the primary and secondary windings respectively. The peak value of flux density is required to be not more than 1.5 wb/m^2 . Calculate the required cross sectional area of the steel core. If the output is 10KVA . Calculate the secondary current.

6. (a) How do you classify the induction motors. Give the constructional details of them.

(b) Define slip and give an account of the quantities which vary with slip.

7. The OC and SC tests data on a 3-phase, 1 MVA , 3.6KV , star connected Alternator is given below :

If Amps	60	70	80	90	100	110
OC volts	2560	3000	3360	3600	3800	3960
SC Amps	180					

The resistance measured between the terminals is 2 Ohms .Find the % regulation at full load 0.707PF lag and 0.8 PF lead by synchronous impedance method.

8. (a) Each branch of a three phase star connected load consists of a coil of resistance 4.2 Ω, and reactance 5.6 Ω, the load is supplied at a line voltage of 415V, 50Hz. The total active power supplied to the load is measured by the two wattmeter method.

(b) Draw a circuit diagram of wattmeter connections and calculate their separate readings. Derive any formula used in your calculations.

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Code No: RR210303 **Set No.4**

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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Calculate the unknown resistance R and the current flowing through it when the current in the branch OC is zero.(figure 1)

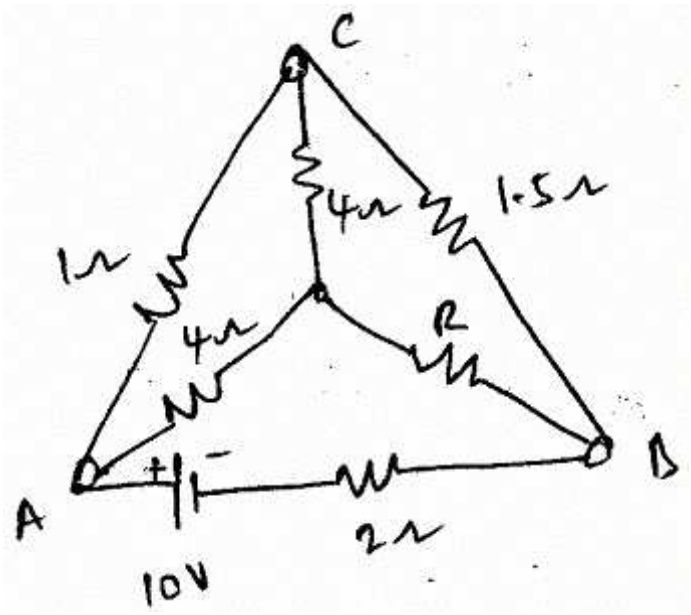

Figure 1:

2. (a) Two Voltage shapes are expressed by,
   i. e = 300 Sin θ
   ii. e = 300 Cos θ

   Determine their instantaneous values at the following values of $\theta; 30^0, 45^0, 60^0, 120^0, 270^0$

   (b) Three voltages represented by the following equations:
   e_1= 15Sinϖt; e_2= 5Sin(ϖt+$\pi/6$); e_3= 10Cos(ϖt);
   act together in an a.c. circuit .Represent these voltages by phasors and calculate an expression for the resultant voltage. Check the result so obtained graphically.

3. (a) A four pole dc generator runs at 900rpm and is lap wound and has a useful flux per pole of 0.07wb. The armature windings consists of 220turns each of 0.004 ohms resistance. Calculate the terminal voltage when running at 900rpm if the armature current is 50A.

(b) A four pole lap wound generator has 56 coils with 6 turns per coil. The speed is 1150 rpm. What must be the flux per pole in order to generate 265V ? How many commutator bars are required for this generator?

4. (a) Derive the condition for maximum power in a dc motor.

   (b) A 4-pole, wave-connected shunt motor gives 11.19KW when running at a 1000rpm and drawing armature and field current of 50A and 1A respectively. It has 540 conductors. Its resistance is 0.1 Ω. Assuming a drop of 1 V per brush, find

   i. total torque
   ii. useful torque
   iii. useful flux/pole
   iv. rotational losses
   v. efficiency.

5. (a) Derive the EMF equation of a transformer.

   (b) In no load test on a 1-phase transformer the following test data were obtained.

   i. Primary voltage 220V
   ii. Secondary voltage 110 V
   iii. Primary current 0.5A
   iv. Power input 30Watts
   v. Resistance of primary winding = 0.6Ω

   Calculate

   i. turns ratio
   ii. magnetizing component of no load current.
   iii. working component of no load current.
   iv. iron loss.

6. (a) How do you classify the induction motors. Give the constructional details of them.

   (b) Define slip and give an account of the quantities which vary with slip.

7. The OC and SC tests data on a 3-phase, 1 MVA , 3.6KV , star connected Alternator is given below :

If Amps	60	70	80	90	100	110
OC volts	2560	3000	3360	3600	3800	3960
SC Amps	180					

   The resistance measured between the terminals is 2 Ohms .Find the % regulation at full load 0.707PF lag and 0.8 PF lead by synchronous impedance method.

8. (a) Describe with the diagram the construction of a repulsion type moving iron instrument with particular reference to the means used for

i. deflection
ii. control
iii. damping.

(b) A moving iron voltmeter in which full scale deflection is given by 100V, has a coil of 10000 turns and a resistance 2000Ω. Calculate the number of turns required on the coil of the instrument is converted for use as an ammeter reading 20A full scale deflection.

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