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

**II B.Tech. I Semester Regular Examinations, November -2005**
**ELECTRICAL ENGINEERING**
**( Common to Mechanical Engineering, Chemical Engineering, Mechatronics, Metallurgy & Material Technology, Production Engineering and Automobile Engineering)**

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

**Answer any FIVE Questions**
**All Questions carry equal marks**

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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. [6+10]

2. (a) A 230V, 50Hz Single phase supply is feeding following loads which are connected across it
      i. a motor load of 4KW, 0.8 lagging p.f.
      ii. a rectifier of 3KW at 0.6 leading p.f.
      iii. a lighter load of 10 KVA unity p.f.
      iv. a pure capacitive load of 8KV A
      Determine total KW, total KVAR.
   (b) A coil of resistance 15Ω and inductance of 0.05H is connected in parallel with a non-inductive resistance of 20Ω. Find
      i. the current in each branch
      ii. the total current
      iii. the phase angle of whole arrangement for a applied voltage of 200V at 50Hz.

   [8+8]

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+8+4]

4. (a) Explain DC motor principle and its working

(b) A 250v shunt motor on no-load runs at 1000rpm and takes 5A the total armature and shunt field resistances are 0.2 Ω and 250 Ω respectively calculate the speed when loaded and taking current of 50A if armature reaction weakens the filed by 3%.

[6+10]

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.

[8+8]

6. Explain about Delta/Delta connection of Transformers in detail A500 -KVA, 3-phase 50 Hgs Transformer has a voltage Ratio (line voltages) of 33/11 KV and is Delta/Star connected. The resistances per phase are : High voltage 35Ω, low voltage 876 Ω and the Iron loss is 3050 W. Calculate the efficiency at full load and one-half of full load respectively

   (a) at unity PF

   (b) 0.8 PF.

[16]

7. A 1MVA , 11KV, 3phase star connected alternator has the following OCC Test data:

| | | | | |
|---|---|---|---|---|
| $I_f$Amps | 50 | 110 | 140 | 180 |
| Voc (lilne Volts) | 7000 | 12500 | 13750 | 15000 |

   The short circuit test yielded full load current at a field current of 40 Amps.

   The armature resistance per phase is 0.6 Omhs. Find the % regulation of Half

   Full load at 0.8PF lagging and at full load, 0.9PF leading. [16]

8. (a) Why is spring control to be preferred to gravity control in an electrical measuring instrument?

(b) The coil of a moving coil meter has resistance of 5Ω and given full scale deflection when a current of 15mA passes through it. What modification must be made to the instrument to convert it into

i. an ammeter reading to 15A

ii. a voltmeter reading to 15V?

[8+8]

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Code No: RR210303 **Set No.2**

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1. Deduce the current I in the circuit shown in figure1. All the resistances are in ohms.

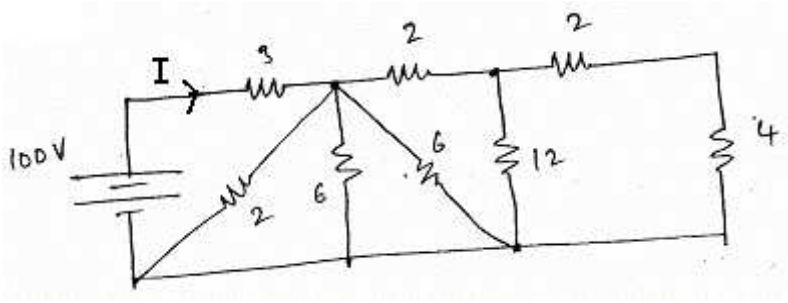


Figure 1:

[16]

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

[8+8]

3. (a) A 4 pole d.c. generator has a wave wound armature with 792 conductors. The flux/pole is 0.0121Wb. Determine the speed at which it should be run to generate 240V on no load.
   (b) A d.c. generator generates an emf of 520V. It has 2000 armature conductors, flux/pole of 0.013Wb, speed of 1200rpm and the armature winding has 4 parallel paths. Find the number of poles.
   (c) When driven at 1000rpm with a flux/pole of 0.02Wb, a d.c. generator has an emf of 200V. If the speed is increased to 1100rpm and at the same time the flux/pole is reduced to 0.019Wb/pole, what is the induced emf?

[5+5+6]

4. (a) A 100 kw, 460 V shunt generator was run as motor on no load at its rated voltage and speed. The total current taken was 9.8A including shunt current of 2.7A. The resistance of the armature circuit at normal working temperature was 0.11 Ω. Calculate the efficiency at
      i. full-load

ii. half full-load.

(b) Mention the advantages of swinburne's test.

[12+4]

5. (a) In a 50 KVA, 11 KV/400V Transformer, the Iron and Copper losses are 500W and 600W respectively under rated conditions.
   i. Calculate the efficiency on unity power factor at full load.
   ii. Find the load for maximum efficiency of the Iron and Copper losses corresponding to this load.

   (b) What are the various losses taking place in a Transformer? State the parts of a Transformer in which they occur classify them into constant, and variable losses.

   [8+8]

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.

   [8+8]

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+8]

8. (a) Sketch and describe the construction of a moving coil ammeter and give the principle of operation.

   (b) A moving coil instrument gives full scale deflection with 15mA and has a resistance of 5Ω. Calculate the resistance of the necessary components in order that the instrument may be used as
   i. a 2A - Ammeter
   ii. a 100V voltmeter.

   [8+8]

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1. (a) Derive the formula for magnetic force of a long straight conductor.
   (b) A current of 15A is passing along a straight wire. Calculate the force on a unit magnetic pole placed 0.15 m from the wire. [10+6]

2. (a) Discuss the effects of varying the frequency upon the current drawn and the p.f. in all R-L-C series circuit.
   (b) A reactor having resistance of 4.5 ohm and 0.1 H respectively, is connected in series with a capacitance of 90 micro F. The circuit is energized from 230 V a. c. mains. Draw the curves of inductive reactance, capacitive reactance, resultant reactance, impedance, current voltage across the condenser to base of frequency. Take the values of frequency between O and 100 Hz.

   [6+10]

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.

   [10+6]

4. In a test on a d.c. shunt generator whose full load output is 200 KW at 250V, the following figures were obtained:
   (a) When running light as a motor at full speed, the line current was 36A, the field current 12A and the supply voltage 250V.
   (b) With the machine at rest, a p.d. of 6v produced a current of 400A through the armature circuit.

   Explain how these results may be utilized to obtain the efficiency of the generator at full load and half full load. Neglect voltage drop at the brushes.[16]

5. (a) In a test for the determination of the losses of a 440V, 50Hz transformer, the total iron losses were found to be 2500W at normal voltage and frequency. When the applied voltage and frequency were 220V, 25Hz, the iron loss were found to be 850W. Calculate the hysterisis and eddy current losses at normal voltage and frequency.

(b) The following readings were obtained from OC and SC tests on 8KVA, 400/120V, 50Hz , transformer.

| | | | | |
|---|---|---|---|---|
| OC Test | on LV side | 120V | 4A | 75W |
| SC Test | on HV side | 9.5V | 20A | 110W |

Calculate the voltage regulation and efficiency at full load 0.8 P.F lagging.

[8+8]

6. (a) Explain the rotating magnetic field developed in an Induction Motor.

   (b) A12 pole 3- phase alternator coupled to an engine running at 500rpm. It supplies an induction motor which has a full load speed of 1440rpm. Find the % slip and the number of poles of the motor.

[9+7]

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+8]

8. Two wattmeters connected to measure the input to a balanced three phase circuit indicate 2500W and 500W respectively. Find the power factor of the circuit.

   (a) when both readings are positive and

   (b) when the later readings is obtained after reversing the connections to the current coil of one instrument. Draw the phasor and connection diagrams.

[16]

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

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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 2) [16]

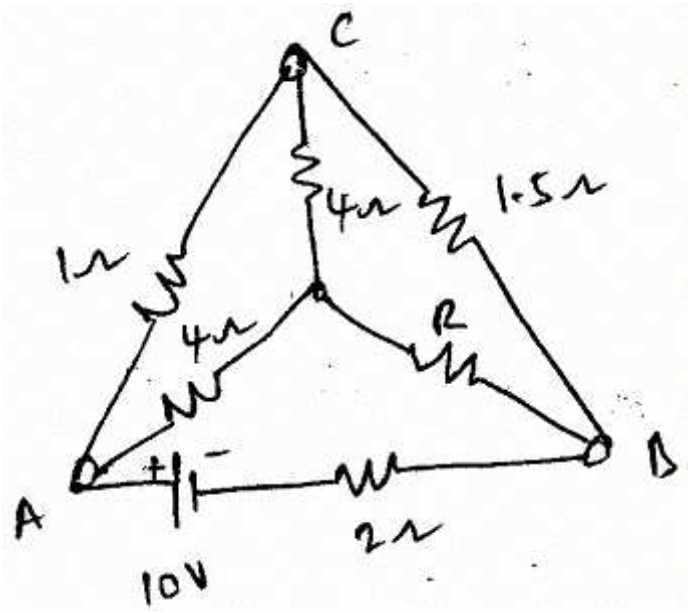


Figure 2:

2. (a) Deduce the relation between resonant frequency and half power frequencies.
   (b) A series L-C circuit has L=100PH, C=2500$\mu$F and Q=70. Find
      i. resonant frequency $f_o$
      ii. half power points and
      iii. bandwidth.

[8+8]

3. (a) A shunt generator delivers 195A at a terminal p.d of 250V the armature resistance and the shunt field resistances are 0.02ohms and 50ohms respectively. The iron and friction losses equal 950W. Find
      i. emf generated
      ii. copper losses

iii. output of the prime motor

iv. Mechanical and Electrical efficiencies.

(b) A 10KW, 250V d.c six pole shunt generator runs at 1000rpm when delivering full load. The armature has 534 lap connected conductors, full load copper losses are 0.64KW. The total brush drop is 1V. Neglect shunt current and Determine the flux per pole.

[8+8]

4. (a) Explain the significance of back emf in a d.c. motor and explain how it controls the value of armature current in d.c. motor?

(b) A 250V shunt motor takes a total current of 20A. The shunt field and armature resistances are 200Ω and 0.3 Ω respectively. Determine

i. Value of back emf

ii. gross mechanical power in the armature.

[8+8]

5. (a) How do you classify the transformers based on constructions and why the Transformer core is laminated.

(b) A250/500V transformer gave the following test results:

Short circuit test : 20V; 12A, 100Watts on HV side

Open circuit test: 250V, 1A, 80Watts on LV side

Calculate the efficiency when the output is 10A , 500V and 0.8 power factor lagging.

[6+10]

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.

[9+7]

7. (a) What is distribution factor? What are its effects? Derive an expression for distribution factor of an alternator?

(b) In a 60 KV A, 200V, I-phase alternator, the effective armature resistance, and leakage reactance are 0.016 ohm, and 0.07 ohm respectively. Calculate the emf induced in the armature, when the alternator is delivering rated current at a p.f. of

i. unity;

ii. 0.7 lagging.

[8+8]

8. Two wattmeters connected to measure the input to a balanced three phase circuit indicate 2500W and 500W respectively. Find the power factor of the circuit.

(a) when both readings are positive and

(b) when the later readings is obtained after reversing the connections to the current coil of one instrument. Draw the phasor and connection diagrams.

[16]

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