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

II B.Tech I Semester Supplementary Examinations, November 2006
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. Calculate the unknown resistance R and the current flowing through it when the current in the branch OC is zero.(figure 1) [16]

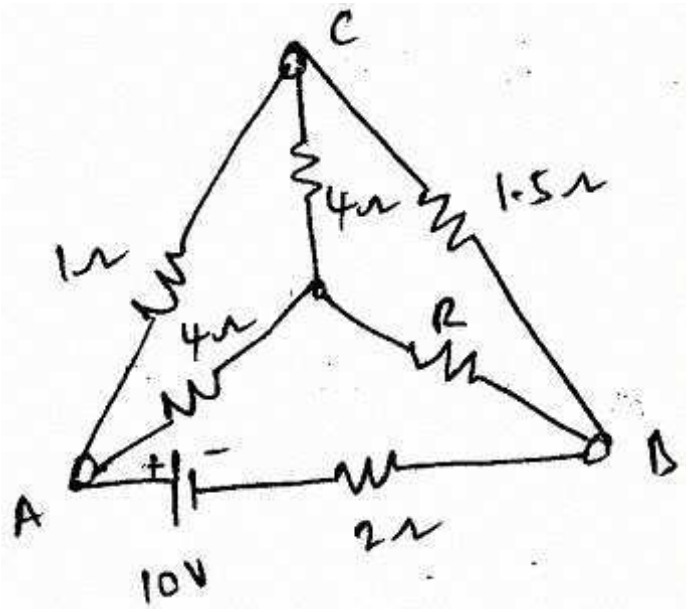

Figure 1

2. (a) Represent the following qualities by vectors:
   5 Sin(2πft − 1); 3 Cos(2πft + 1);
   2 Sin(2πft + 2.5) and 4 Sin(2πft − 1)
   (b) An alternating current of 50 Hz following the Sine law has a r.m.s. value of 50 A. Write down the equation for the instantaneous current. Calculate the instantaneous current
      i. 0.0025 s and
      ii. 0.0125 s, after passing through positive maximum value. At what time, measured from positive maximum value, will the instantaneous current be 35.35 a. [8+8]

3. (a) What is the need of a multiplex winding in a d.c. machine?
   (b) What does the name plate of a d.c. generator generally indicate?
   (c) A 4 pole machine running at 1500 rpm has an armature with 90 slots and 6 conductors/slot. The flux/pole is 10mWb. Determine the terminal emf as

d.c. generator if the coils are lap connected. If the current/conductor is 100A, determine the electrical power. [4+4+8]

4. (a) Explain the classification of dc motors with neat diagrams and corresponding voltage equations for each.

   (b) The armature of a dc machine has a resistance of 0.1 Ω and is connected to a 230V supply. Calculate the back emf when it is running as a motor taking 80A. [12+4]

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. [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) What are the three voltage drops occurring in an alternator on-load?

   (b) A 550 V, 55 KV A, single phase alternator has an effective resistance of 0.2 ohm. A field current of lOA produces an armature current of 200 A on short circuit, and an emf of 450 V on open circuit. Calculate

      i. The synchronous reactance;
      ii. The full- load regulation with power factor 0.8 lagging. [8+8]

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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Answer any FIVE Questions
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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. [8+8]

2. (a) Briefly explain how alternating voltages are generated.
   (b) A square coil of 10cm side and 100 turns is rotated at a uniform speed of 1000 revolutions per minute, about an axis at right angles to a uniform magnetic field of 0.5wb/m^2. Calculate the instantaneous value at induced electromotive force, when the plane at the coil in
      i. at right angles to the field
      ii. in the plane of the field. [10+6]

3. (a) Give a brief note on lap and wave windings.
   (b) A lap connected d.c. generator has 8 poles and 120 slots with 8 conductors in each slot. If the flux/pole is 0.035Wb
      i. find the emf generated when the speed is 600rpm.
      ii. What should be the speed of rotation if the induced emf is to be 500V? [6+10]

4. (a) Why is the speed of a shunt motor practically constant?
   (b) Draw the characteristics of shunt and series motors. [4+12]

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. 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) 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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1. (a) Explain "dynamically induced EMF".
   (b) Find the inductance of a coil in which a current of 0.2A increasing at the rate of 0.4A per second represents a power flow of 0.4 watt. [8+8]

2. (a) Relation between Average value and RMS value.
   (b) Calculate form factor for Half wave rectified current. [8+8]

3. (a) Draw the characteristics of a compound generator.
   (b) In a long shunt compound generator, the terminal voltage is 230V when the generator delivers 150A. Determine
      i. Induced emf
      ii. total power generated
      iii. Distribution of this power.
      Given that shunt field, series field, divertor and armature resistances are 92, 0.015, 0.03 and 0.032 ohms respectively. [4+12]

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. [4+12]

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_fAmps	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. 4**

II B.Tech I Semester Supplementary Examinations, November 2006
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Answer any FIVE Questions
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1. State and prove the Kirchhoff's laws with examples. [16]

2. (a) A voltage V is applied across two impedances in parallel. The value of impedances are (3-j3)ohms, and (5+j2) ohms. Voltage across 3Ω is 45V. Calculate applied voltage V and current I.
   (b) A voltage of 200 ∠ 53°8' is applied across two impedance in parallel. The values of impedances are (12+j16) and (10-j20). Determine the KVA, KVAR and KW in each branch and the power factor of the whole circuit. [8+8]

3. (a) Mention and explain the various causes for the failure of the generator to build up.
   (b) The terminal voltage of a generator falls from 250V on open circuit to 238V when delivering 60A. It is connected to a load in parallel with a battery having a constant emf of 245V and a resistance of 0.1 ohm. Find the current supplied by the generator when the total load current is 50A. [8+8]

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) 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. [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 the calculation part of %regulation after conducting OC and SC tests using EMF method.

(b) 100KVA , 3KV, 50Hz, 3-phase star connected alternator has effective arrmature resistance of 0.2 Ohms . The field current of 30Amps produces SC current of 180 Amps and an OC volts of 1060V (line value). Calculate the full load voltage regulation at 0.707 PF lag and 0.8PF leading. Draw the phaser diagram. [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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