Code No: RR211001 **Set No. 1**

II B.Tech I Semester Supplementary Examinations, November 2006
ELECTRICAL TECHNOLOGY
(Common to Electronics & Instrumentation Engineering, Bio-Medical Engineering and Electronics & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain how a.c. voltage generated is converted to D.C. voltage in a generator?
   (b) What is the main purpose of laminating the armature core of a D.C. Generator.
   (c) A 4-pole, long shunt, lap wound generator supplies 25kw at a terminal voltage of 500 V. The armature resistance is 0.03Ω, series field resistance is 0.04Ω and shunt field resistance is 200Ω. The brush drop may be taken as 1 V. Determine the e m f generated. [5+3+8]

2. (a) Explain speed control of a D.C Series Motor.
   (b) A 200 V d.c. Series Motor runs at 1000rpm when operating at its full load current of 30 A. The motor resistance is 0.5Ω and the magnetic circuit can be assumed unsaturated what will be the speed if
      i. the load torque is increased by 44%
      ii. the motor current is 20 A. [6+10]

3. (a) Draw the phasor diagrams of a transformer:
      i. on open circuit
      ii. on load indicating in each case what the various phasors represent.
   (b) Derive the emf equation of 1-Phase transformers and evaluate the emf/turn, if flux is 0.01wb, at a frequency of 50 Hz. [8+8]

4. Describe the exact and approximate equivalent circuit of a single-phase transformer. Also describe experiments to obtain the parameters of the equivalent circuits. [16]

5. (a) Explain various power stages of a 3-phase induction motor.
   (b) A 3-phase induction motor with r2 / x2 = 0.5, has a starting torque of 25.0 Nm. For negligible stator impedance and no-load current, determine the starting torque in case the rotor-circuit resistance per phase is
      i. doubled
      ii. halved. [6+10]

6. (a) Draw the open circuit and short circuit characteristics of a synchronous generator. Explain the shape of the characteristics.
   (b) Determine the voltage regulation of a 200V per phase alternator at 0.8p.f lag giving a current of 100A is produced on short circuit by a field excitation of 2.5A.An e.m.f of 500V is produced on open circuit by the same excitation. The armature resistance is 0.8 ohm. [8+8]

7. (a) Explain the principle of working of synchronous motor.
   (b) A 3 phase, 1385 V star connected synchronous motor having synchronous reactance of 2ohm per phase and negligible resistance takes an input of 207.8 kw with an induced e.m.f of 916.5V per phase. Calculate the motor line current and its power factor. [8+8]

8. (a) What is a stepper motor? Enumerate its advantages and applications.
   (b) With neat sketch, explain the working principle of shaded-pole single-phase induction motor. [8+8]

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Code No: RR211001 **Set No. 2**

II B.Tech I Semester Supplementary Examinations, November 2006
ELECTRICAL TECHNOLOGY
(Common to Electronics & Instrumentation Engineering, Bio-Medical Engineering and Electronics & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain how a.c. voltage generated is converted to D.C. voltage in a generator?
   (b) What is the main purpose of laminating the armature core of a D.C. Generator.
   (c) A 4-pole, long shunt, lap wound generator supplies 25kw at a terminal voltage of 500 V. The armature resistance is 0.03Ω, series field resistance is 0.04Ω and shunt field resistance is 200Ω. The brush drop may be taken as 1 V. Determine the e m f generated. [5+3+8]

2. (a) Explain with a neat sketch the principle of operation of a D.C. Motor.
   (b) A 4-pole series motor has 944 wave-connected armature conductors. At a certain load the flux per pole is 34.6 mWb and the total mechanical torque developed is 209 Nm. Calculate the line current taken by the motor and the speed at which it will run with an applied voltage of 500V. Total armature resistance is 3Ω. [8+8]

3. (a) Draw the phasor diagram of transformer under loaded conditions.
   (b) Explain the principle of working of 1-Phase transformer on no-load conditions. Also explain the nature of no-load current. [8+8]

4. Describe the exact and approximate equivalent circuit of a single-phase transformer. Also describe experiments to obtain the parameters of the equivalent circuits. [16]

5. (a) Explain the principle of rotating magnetic field and hence prove that it is of constant magnitude and rotates at synchronous speed.
   (b) A 3-phase, 4 pole 50 Hz induction motor has a full-load speed of 1440 r.p.m. For this motor, calculate the following
      i. full-load slip and rotor frequency
      ii. speed of stator field with respect to
         A. stator structure and
         B. rotor structure and
      iii. speed of rotor field with respect to
         A. rotor structure
         B. stator structure and
         C. stator field. [8+8]

6. (a) Define voltage regulation of an alternator. Explain synchronous impedance method of determining regulation of an alternator.

(b) Calculate the voltage induced per phase in a 3phase 50 Hz, alternator having a flux per pole of 0.1515 wb. The no. of conductors in series are 360. Assume full pitch coil with a distribution factor of 0.96. [8+8]

7. (a) Compare $3-\phi$ induction motor with $3-\phi$ synchronous motor if any four aspects.

(b) The input to an 1100 V, 3 phase star connected synchronous motor is 60 A. The effective resistance and synchronous reactance per phase is 1 ohm and 30 ohm respectively. Find the power supplied to the motor and the induced e.m.f for a power factor of 0.95 leading. [6+10]

8. (a) Explain the operation of a single phase induction motor on the basis of double revolving field theory.

(b) Draw a typical torque-speed curve of a single-phase induction motor on the basis of double revolving field theory. [8+8]

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Code No: RR211001 **Set No. 3**

II B.Tech I Semester Supplementary Examinations, November 2006
ELECTRICAL TECHNOLOGY
(Common to Electronics & Instrumentation Engineering, Bio-Medical Engineering and Electronics & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain how a.c. voltage generated is converted to D.C. voltage in a generator?
   (b) What is the main purpose of laminating the armature core of a D.C. Generator.
   (c) A 4-pole, long shunt, lap wound generator supplies 25kw at a terminal voltage of 500 V. The armature resistance is 0.03Ω, series field resistance is 0.04Ω and shunt field resistance is 200Ω. The brush drop may be taken as 1 V. Determine the e m f generated. [5+3+8]

2. (a) Explain various power stages of in a D.C. Motor.
   (b) What will happen when a D.C. Series Motor is started without a load connected to it?
   (c) A 200V d.c. series motor runs at 750 rpm when taking a current of 30A. The resistance of the armature is 0.5Ω and that of field is 0.3Ω. If the current remains constant, calculate the resistance necessary to reduce the speed to 250rpm. [4+4+8]

3. (a) Explain the principle of operation of transformer. Derive its e. m. f. equation.
   (b) A 1-phase transformer has 180 turns respectively in its secondary and primary windings. The respective resistances are 0.233Ω and 0.067Ω.
   Calculate the equivalent resistance of
      i. the primary in terms of the secondary winding,
      ii. the secondary in terms of the primary winding, and
      iii. the total resistance of the transformer in terms of the primary. [8+8]

4. (a) Write short notes on open circuit and short circuit tests on 1-phase transformers.
   (b) Calculate the effective resistance and leakage reactance of a transformer, in terms of primary the following data on test with the secondary terminals, short-circuited: Applied voltage, 60V; current, 100A; Power input, 1.2kW. [10+6]

5. (a) Explain the principle of rotating magnetic field and hence prove that it is of constant magnitude and rotates at synchronous speed.
   (b) A 3-phase, 4 pole 50 Hz induction motor has a full-load speed of 1440 r.p.m. For this motor, calculate the following
      i. full-load slip and rotor frequency

ii. speed of stator field with respect to
   A. stator structure and
   B. rotor structure and

iii. speed of rotor field with respect to
   A. rotor structure
   B. stator structure and
   C. stator field. [8+8]

6. (a) Define voltage regulation of an alternator. Explain synchronous impedance method of determining regulation of an alternator.

   (b) Calculate the voltage induced per phase in a 3phase 50 Hz, alternator having a flux per pole of 0.1515 wb. The no. of conductors in series are 360. Assume full pitch coil with a distribution factor of 0.96. [8+8]

7. (a) A 3-ϕ, 6600v; 50Hz; Y connected synchronous motor takes 50 A current. The resistance and synchronous reactance per phase are 1 ohm and 20Ω respectively. Find the power supplied to the motor and induced e.m.f. for a powerfactor of

   i. 0.8 lagging and

   ii. 0.8 leading.

   (b) Derive expressions for distribution factor and pitch factor. [8+8]

8. (a) Draw a diagram showing the construction of a stepper motor and discuss its operation.

   (b) Discuss the various applications of stepper motor. [10+6]

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Code No: RR211001 **Set No. 4**

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain how a.c. voltage generated is converted to D.C. voltage in a generator?
   (b) What is the main purpose of laminating the armature core of a D.C. Generator.
   (c) A 4-pole, long shunt, lap wound generator supplies 25kw at a terminal voltage of 500 V. The armature resistance is 0.03Ω, series field resistance is 0.04Ω and shunt field resistance is 200Ω. The brush drop may be taken as 1 V. Determine the e m f generated. [5+3+8]

2. (a) What are all the various losses in a D.C. Machine?
   (b) A series motor of resistance 1 ohm between terminals runs at 1,000rpm at 250Vwith a current of 20A. Find the speed at which it will run when connected in series with a 6Ω resistance and taking the same current at the same supply voltage.
   (c) Derive an expression for efficiency of a D.C. Machine. [4+8+4]

3. (a) Explain the principle of operation of transformer. Derive its e. m. f. equation.
   (b) A 1-phase transformer has 180 turns respectively in its secondary and primary windings. The respective resistances are 0.233Ω and 0.067Ω.
   Calculate the equivalent resistance of
      i. the primary in terms of the secondary winding,
      ii. the secondary in terms of the primary winding, and
      iii. the total resistance of the transformer in terms of the primary. [8+8]

4. (a) With neat circuit diagrams, explain the procedure for conducting OC & SC tests on a given single-phase transformer to predetemine its regulation & efficiency.
   (b) A 100KVA, 1000V / 10000V, 50Hz, single phase transformer has an iron loss of 1200 W, find the maximum efficiency at 0.8 power factor lagging if the copper loss is 500 W with 6A in high voltage winding. Also calculate the corresponding regulation if the equivalent leakage reactance referred to HV is 10 ohms. [10+6]

5. (a) Sketch torque-speed characteristics of an induction motor working at rated voltage and frequency, deriving necessary expressions.

(b) A 3-phase, 50 Hz, 400 V, wound-rotor induction motor runs at 960 r.p.m. at full-load. The rotor resistance and standstill reactance per phase are 0.2Ω *and* 1Ω respectively. If a resistance of 1.8Ω is added to each phase of the rotor at standstill, what would be the ratio of starting torque with full voltage and the added resistance to the full-load torque under normal running conditions? [8+8]

6. (a) Explain the tests to be conducted for determining synchronous impedance.

   (b) A 100KVA, 6.6KV, 3phase star connected synchronous generator has a synchronous reactance of 25 ohm per phase. It supplies full load current at 0.75 p.f lagging and a rated terminal voltage. Compute the terminal voltage for the same excitation when the generator supplies full load current at 0.8 p.f leading. [8+8]

7. (a) Explain the principle of working of synchronous motor.

   (b) A 3 phase, 1385 V star connected synchronous motor having synchronous reactance of 2ohm per phase and negligible resistance takes an input of 207.8 kw with an induced e.m.f of 916.5V per phase. Calculate the motor line current and its power factor. [8+8]

8. (a) Single phase induction motors are not self starting. Explain Why?

   (b) How is single-phase induction motors made self started? Explain one method. [8+8]

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