Code No: RR220402 **Set No. 1**

II B.Tech Supplimentary Examinations, Aug/Sep 2008
ELECTRICAL TECHNOLOGY
(Common to Electronics & Communication Engineering, Computer Science & Engineering, Information Technology, Computer Science & Systems Engineering, Electronics & Telematics, Electronics & Computer Engineering and Instrumentation & 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) With a neat sketch, explain the working of a 3-point starter for d.c. shunt motor
   (b) A 6-pole, 250V series motor is wave-connected. There are 240 slots and each slot has 4 conductors. The flux per pole is $1.75X10^{-2}Wb$ when the motor is taking 80A. The filed resistance is 0.05Ω, the armature resistance is 0.1Ω and the iron and frictional loss is 0.1kw. Calculate
      i. Speed
      ii. bhp and
      iii. shaft torque. [7+9]

3. (a) Derive the e. m. f. equation of a single-phase transformer and draw the no-load phaser diagram.
   (b) A 40 kVA transformer with ratio of 2000 / 250 V has a primary resistance of 1.15Ω and a secondary resistance of 0.0155Ω. Calculate
      i. the total resistance interms of secondary winding,
      ii. the total resistance drop on full load, and
      iii. the total copper loss on full load. [8+8]

4. (a) Obtain the equivalent circuit of a single-phase transformer. Explain how to evaluate the equivalent circuit of a transformer from open circuit & short circuit tests. [4+6]
   (b) A 5 kVA, 220 / 110 volts, 1-phase transformer has a maximum efficiency of 96.97% at 0.8 p.f. lagging. It has a core loss of 50 watts and the full load regulation at 0.8 p.f. lagging is 5%. Find the efficiency and regulation at full load 0.9 p.f. lagging. [6]

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) Derive e.m.f equation for an alternator and explain distribution factor and pitch factor used in e.m.f. Equation.
   (b) Write the expression showing the relationship between speed frequency and no. of poles of a synchronous machine. The speed of rotation of the turbine driving an alternator is 166.7 r.p.m. What should be the no. of poles of the alternator if it is to generate voltage 50HZ. [10+6]

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) 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: RR220402 **Set No. 2**

II B.Tech Supplimentary Examinations, Aug/Sep 2008
ELECTRICAL TECHNOLOGY
(Common to Electronics & Communication Engineering, Computer Science & Engineering, Information Technology, Computer Science & Systems Engineering, Electronics & Telematics, Electronics & Computer Engineering and Instrumentation & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the procedure to find critical field resistance and critical sped of a D.C. Machine. Also explain the importance of these terms.
   (b) The magnetization characteristics of a shunt generator at 1,000rpm is as follows:

O C Volts	62.5	107.5	155.0	196.5	231.0	256.0	275.0	283.0
Field Amperes	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

   Estimate the no-load terminal voltage of the machine when run at 800rpm with 20 ohms field circuit resistance. [8+8]

2. (a) What is the significance of the back e.m.f. of a D.C. Motor?
   (b) Deduce the condition for maximum power for a D.C. Motor?
   (c) A 220V shunt motor with an armature resistance of 0.5Ω is excited to give constant main field. At full load the motor runs at 500 rpm and takes an armature current of 30A. If a resistance of 1.0Ω is placed in the armature circuit, find the speed at
      i. full-load torque
      ii. double full-load torque. [4+4+8]

3. (a) Develop the equivalent circuit of a single-phase transformer and draw its phasor diagram for a leading power factor load.
   (b) A single phase 230/115V, 50Hz, 2.5KVA, transformer has 110 turns as Primary as HV side. Determine the emf/turn, number of terms of LV side, full load currents as hv/Lv sides. [8+8]

4. (a) Obtain the equivalent circuit of a 1-phase transformer from the fundamentals? What are the assumptions made to obtain approximate equivalent circuit? [6+2]
   (b) A 20-kVA transformer has its maximum efficiency of 0.98 at 15kVA at upf. The iron loss is 350 W. Calculate the efficiency at full load 0.8 p f lag and upf. [8]

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) Explain the synchronous impedance method of computing the voltage regulation.

(b) A 3 phase, 12 pole, star connected alternator has 180 slots with 10 conductors per slot and the conductors of each phase are connected in series. The coil span is 144 degrees (electrical). Determine the phase and line value of e.m.f. If the machine runs at 1600 r.p.m and the flux per pole is 0.06 Weber distributed sinusoidally over the pole. [8+8]

7. (a) Explain the principle of operation of synchronous motors.

(b) A 3-phase alternator is rated at 5 KVA, 110V, 26.3A, 50 Hz and 1200 r.p.m. The stator resistance between terminals as measured with dc is 0.2 ohm. With no load and rated speed the stator line voltage is 160V for a field current of 4A.At rated speed, the short circuit stator current per terminal is 50A for a field current of 4A.compute voltage regulation of alternator at 0.8 p.f. Lagging. Using synchronous impedance method. [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: RR220402 **Set No. 3**

II B.Tech Supplimentary Examinations, Aug/Sep 2008
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 the basic principle of operation of a D.C. Generator?
   (b) Discuss the reasons for failure of self excitation, and suggest the remedies.
   (c) A 250V d.c. shunt machine has line current of 80A. It has armature and field resistances of 0.1Ω and 125Ω respectively. Calculate power developed in armature when running as
      i. generator
      ii. motor. [5+5+6]

2. (a) Why is starter necessary for a DC motor.
   (b) Explain the working of a 3-point starter with a circuit diagram for a DC shunt motor.
   (c) A 230V shunt motor has an armature resistance of 0.2Ω. The starting armature current must not exceed 50A. If the number of sections are 5, calculate the values of resistance steps to be used in the starter. [3+7+6]

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) Define efficiency of a transformer. Obtain the condition for maximum efficiency. [2+6]
   (b) A 25 kVA, 2500 / 250 V, single-phase transformer gave the following test results.

O.C. test (LV side):	250 V	1.4A	105 Watts
S.C. test (HV side):	105V	8A	320 Watts

   Compute the equivalent circuit parameters referred to LV side and HV side. Also obtain percentage regulation at full load with 0.8 power factor lagging. [8]

5. (a) Explain the Autotransformer starters used in induction motors. What are its advantages? [6+2]

   (b) A 200 kW, 3300 V, 6-pole, 50 Hz star-connected slip-ring induction motor has a star connected rotor. Stator to rotor turns ratio is 3.2. Rotor resistance and leakage reactance are 0.1Ω *and* 1Ω respectively. Neglect stator impedance. Find

      i. current and torque at starting on rated voltage and with slip rings short circuited and

      ii. the external resistance required to reduce the starting current to 50 A with across-the-line starting.

      Compute also the starting torque under these conditions. [8]

6. (a) Derive e.m.f equation for an alternator and explain distribution factor and pitch factor used in e.m.f. Equation.

   (b) Write the expression showing the relationship between speed frequency and no. of poles of a synchronous machine. The speed of rotation of the turbine driving an alternator is 166.7 r.p.m. What should be the no. of poles of the alternator if it is to generate voltage 50HZ. [10+6]

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: RR220402 **Set No. 4**

II B.Tech Supplimentary Examinations, Aug/Sep 2008
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) Enumerate the various losses and their remedy to minimize them in a D.C. Machine.
   (b) How do hysteresis, eddy current, friction and windage losses depend upon the speed of a D.C. Machine? Explain.
   (c) A 200V D.C. Shunt machine has armature and field resistances 0.2Ω and 200Ω respectively. The line current is 40A.

   Find
   i. output as generator
   ii. input as motor
   iii. power developed in armature and
   iv. copper losses in both the cases. [6+5+5]

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) What are the transformer tests? Explain.
   (b) Calculate the efficiencies at half-full and 1¼ load of a 100kVA transformer for power factors of
   i. unity;

ii. 0.8, the copper loss is 1000W at full load = iron loss. [10+6]

5. (a) Explain the rotor resistance starter for an induction motor.

   (b) A 3-phase, 6 pole, 400 V, 50 Hz induction motor. takes a power input of 35 kW at its full-load speed of 890 r.p.m. The total stator losses are 1 kW and the friction and windage losses are 1.5 kW.
   Calculate

   i. slip
   ii. rotor ohmic losses
   iii. shaft power
   iv. shaft torque and
   v. efficiency. [6+10]

6. (a) Derive e.m.f equation for an alternator and explain distribution factor and pitch factor used in e.m.f. Equation.

   (b) Write the expression showing the relationship between speed frequency and no. of poles of a synchronous machine. The speed of rotation of the turbine driving an alternator is 166.7 r.p.m. What should be the no. of poles of the alternator if it is to generate voltage 50HZ. [10+6]

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) Give the description of A.C tachometer and mention its applications.

   (b) Write a short note on shaded pole type servo-motor. [8+8]

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