Code No: R05220401 **Set No. 1**

II B.Tech II Semester Regular Examinations, Apr/May 2008
ELECTRICAL TECHNOLOGY
(Common to Electronics & Communication Engineering and Electronics & Telematics)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain with suitable characteristics, the concept of critical resistance and critical speed in a DC machine.
   (b) A Series generator having combined armature and field resistance of 0.4Ω is running at 1000 rpm and delivering 5.5kW at a terminal voltage of 110V. If the speed is raised to 1500 rpm and load is adjusted to 10kW, find the new current and terminal voltage. Assume the machine is working on the straight line portion of the magnetization characteristic. [8+8]

2. (a) Derive an expression for the torque of a DC motor.
   (b) A 240V, 50A, 800rpm DC shunt motor has armature resistance of 0.2Ω. If the load torque is reduced to 60% of its full load value and a resistance of 2Ω. is inserted in series with armature circuit, find the motor speed. Armature reaction weakens the field flux by 4% at full load and by 2% at 60% of full load. [6+10]

3. What is an ideal transformer. Derive an expression for induced emf in a transformer in terms of frequency the maximum value of flux, and the number of turns on the winding. [16]

4. (a) Draw the equivalent circuit of a transformer and explain the procedure to obtain the same from opencircuit and short circuit tests .
   (b) A 10 KVA 2000/250 Volts single phase transformer gave the following test results
   Open circuit test : 250 V, 0.8 A, 50 W
   Short circuit test: 60V 3A 45 W
   Calculate the efficiency and voltage regulation at full load 0.8 power factor lag. [8+8]

5. (a) Explain DOL starter with a neat sketch and obtain the expression for starting toque in terms of Full-load torque.
   (b) A 11KW, 3-phase, 6-pole, 50Hz, 400V Induction Motor runs at 960 r.p.m. on full-load. If it takes 80A on Direct On Line switching, find the ratio of starting torque to full-load torque when started by
      i. DOL starter
      ii. star-delta starter and

iii. Auto Transformer starter with 60% tapping, taking efficiency 95.6% and p.f. 0.834. [8+2+2+2+2]

6. (a) Explain the constructional features of alternator.
   (b) How e.m.f is induced in an 3-phase alternator? Derive the expression for e.m.f induced in an alternator in terms of pitch and distribution factors. [8+8]

7. Using double field revolving theory for single phase induction motors. Give its torque speed characteristic. Why this motor does not have starting torque. [16]

8. (a) Discuss the classification of electrical instruments.
   (b) Explain the significance of controlling torque and damping torque relevant to the operation of indicating instruments. [8+8]

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Code No: R05220401 **Set No. 2**

II B.Tech II Semester Regular Examinations, Apr/May 2008
ELECTRICAL TECHNOLOGY
(Common to Electronics & Communication Engineering and Electronics & Telematics)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain with suitable characteristics, the concept of critical resistance and critical speed in a DC machine.
   (b) A Series generator having combined armature and field resistance of 0.4Ω is running at 1000 rpm and delivering 5.5kW at a terminal voltage of 110V. If the speed is raised to 1500 rpm and load is adjusted to 10kW, find the new current and terminal voltage. Assume the machine is working on the straight line portion of the magnetization characteristic. [8+8]

2. (a) State the reasons for drop in speed of a D.C. Shunt motor when it is loaded.
   (b) Explain why a D.C. Series Motor is best suited for Electric traction applications.
   (c) Explain why a D.C. Shunt Motor can be referred as Constant Speed Motor.
   (d) A 250V unsaturated shunt motor has an armature resistance (including brushes and inter poles) of 0.04Ω and a field resistance of 100Ω.
      i. Find what resistance must be added to the field winding to increase the speed from 1200rpm to 1500rpm when supply current is 200A.
      ii. With the field resistance as in (i) find the speed when the supply current is 100A. [3+3+3+7]

3. Explain the working of a transformer at no load and full load conditions with neat diagrams. [16]

4. (a) What parameters of the equivalent circuit of a transformer can be determined from opencircuit and short circuit tests Explain.
   (b) A 10 KVA 2500/250 Volts single phase transformer gave the following test results
   Open circuit test : 250 V, 0.8 A, 50 W
   Short circuit test: 60V 3A 45 W
   Calculate the efficiency and voltage regulation at full load 0.8 power factor lag. [8+8]

5. (a) Explain why a starter is necessary for starting of 3-phase Induction Motor? Name the starters used for starting 3-phase Induction Motor.
   (b) The power input to rotor of a 440V, 50Hz, 3-phase, 12-pole Induction Motor is 75W. The rotor e.m.f has a frequency of 2Hz. Calculate

i. Slip
ii. rotor speed
iii. rotor copper loss
iv. mechanical power developed [8+8]

6. (a) Explain the constructional features of alternator.
   (b) How e.m.f is induced in an 3-phase alternator? Derive the expression for e.m.f induced in an alternator in terms of pitch and distribution factors. [8+8]

7. Explain the constructional features and principle operation of a single phase induction motor. [16]

8. (a) Discuss the classification of electrical instruments.
   (b) Explain the significance of controlling torque and damping torque relevant to the operation of indicating instruments. [8+8]

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Code No: R05220401 **Set No. 3**

II B.Tech II Semester Regular Examinations, Apr/May 2008
ELECTRICAL TECHNOLOGY
(Common to Electronics & Communication Engineering and Electronics & Telematics)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) With reference to OCC of a D.C. generator, explain the following:
   i. Why emf is not zero when field current is zero?
   ii. Will the residual flux induce a voltage in the machine, if speed of the machine is zero?
   iii. Why does the slope of curve change, after a certain value of field current?
   (b) A separately excited DC generator has no-load voltage of 120V at a field current of 2A, when driven at 1500rpm, Assuming that it is operating on the straight line portion of its saturation curve, Calculate
   i. the generated voltage when the field current is increased to 2.5;
   ii. The generated voltage when the speed is reduced to 1400rpm and the field current is increased to 2.84A. [8+8]

2. (a) Explain the speed load characteristics of a D.C. shunt motor and explain its applications
   (b) A 240V Series motor takes 40A when giving its rated output at 1500 rpm. Its resistance is 0.3Ω . Find what resistance must be added to obtain rated torque
   i. starting
   ii. at 1000 rpm. [8+8]

3. What is an ideal transformer. Derive an expression for induced emf in a transformer in terms of frequency the maximum value of flux, and the number of turns on the winding. [16]

4. What are the different losses occuring in a transformer on load. How can these losses be determined experimentallty. [16]

5. (a) Explain DOL starter with a neat sketch and obtain the expression for starting toque in terms of Full-load torque.
   (b) A 11KW, 3-phase, 6-pole, 50Hz, 400V Induction Motor runs at 960 r.p.m. on full-load. If it takes 80A on Direct On Line switching, find the ratio of starting torque to full-load torque when started by
   i. DOL starter
   ii. star-delta starter and

iii. Auto Transformer starter with 60% tapping, taking efficiency 95.6% and p.f. 0.834. [8+2+2+2+2]

6. (a) Explain the pessimistic method of finding voltage regulation of an alternator.
   (b) A 600V, 60KVA, 1-phase alternator has an effective resistance of 0.2Ω. A field current of 10A produces an armature current of 210A on short-circuit and e.m.f. of 480 V on open-circuit. Calculate Full-load regulation with 0.8 p.f. lagging. [8+8]

7. Explain with neat diagrams the principle of operation of
   (a) AC servo motor
   (b) Stepper motor. [8+8]

8. With a neat sketch explain in detail moving iron attraction type instrument [16]

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Code No: R05220401 **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. Explain the characteristics of a D.C. series and shunt generator. [16]
2. (a) What is the power flow diagram of DC motor? And explain about losses involved in each stage?
   (b) D.C. Shunt machine when running as a motor at no load takes 440W at 220V and runs at 1000r.p.m. the field current and armature resistance are 1A and 0.5Ω respectively. Calculate the efficiency of the machine when running
      i. as a generator delivering 40A at 220V and
      ii. As a motor taking 40A from a 220V supply. [8+8]
3. With neat diagram discuss the principle of working of a transformer. [16]
4. (a) What parameters of the equivalent circuit of a transformer can be determined from opencircuit and short circuit tests Explain.
   (b) A 10 KVA 2500/250 Volts single phase transformer gave the following test results
   Open circuit test : 250 V, 0.8 A, 50 W
   Short circuit test: 60V 3A 45 W
   Calculate the efficiency and voltage regulation at full load 0.8 power factor lag. [8+8]
5. (a) Explain why a starter is necessary for starting of 3-phase Induction Motor? Name the starters used for starting 3-phase Induction Motor.
   (b) The power input to rotor of a 440V, 50Hz, 3-phase, 12-pole Induction Motor is 75W. The rotor e.m.f has a frequency of 2Hz. Calculate
      i. Slip
      ii. rotor speed
      iii. rotor copper loss
      iv. mechanical power developed [8+8]
6. (a) Explain
      i. Leakage reactance
      ii. Synchronous reactance and
      iii. Synchronous impedance of an alternator.

(b) A 3.3KV, 3-phase star-connected alternate has a full load current of 100A. On short-circuit a field current of 5 amperes was necessary to produce full-load current. The e.m.f. on open-circuit for the same excitation was 900 volts. The armature resistance was 0.8 /phase. Determine the full-load voltage regulation for

i. 0.6 p.f. lagging and

ii. 0.6 p.f. leading. [6+10]

7. Show that a single phase winding when excited by a single phase supply produce two equal and opposite revolving fields. [16]

8. What are the requirements of indicating instruments. Explain them in detail. [16]

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