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

II B.Tech. I Semester Supplementary Examinations, May -2005
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 the constructional features of a D.C. Machine with the help of a neat sketch.
   (b) Name the main parts of a D.C. Machine and state the materials of which each part is made.
   (c) Explain different methods of excitation of D.C. Generators with suitable diagrams.

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.

3. (a) Sketch the phasor diagrams of a single-phase transformer for
      i. resistor
      ii. inductor and
      iii. capacitor loads.
   (b) A 220/110V, 50Hz, 1.5KVA, for has by & sec winding resistance of 1Ω *and* 2Ω, and reactance of 3Ω *and* 5Ω respectively find (i) the total. Example resistance equilibrium reactance and equilibrium impedance referred to Py. and Secondary.

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 corresponging regulation if the equivalent leakage reactance referred to HV is 10 ohms.

5. (a) With usual notation deduce the expression for starting torque of a 3-phase induction motor.

   (b) The rotor of a 3-phase induction motor has 0.04Ω resistance per phase and 0.2Ω standstill reactance per phase. What external resistance is required in the rotor circuit in order to get half of the maximum torque at starting? Neglect stator impedance. By what percentage will this external resistance change the current and pf at starting?

6. (a) Draw a neat sketch showing the various parts of a synchronous machine and explain each part briefly.

   (b) A 3ph, 50 Hz, 20 poles Salient pole alternator with star connected stator winding has 180 slots on the stator. Each slot consists of 8 conductors. The flux per pole is 25mwb and is sinusoidally distributed. The coils are full pitch.

   Calculate

   i. the speed
   ii. the generated e.m.f per phase and
   iii. the line e.m.f.

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

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

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

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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 constructional features of a D.C. Machine with the help of a neat sketch.
   (b) Name the main parts of a D.C. Machine and state the materials of which each part is made.
   (c) Explain different methods of excitation of D.C. Generators with suitable diagrams.

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.

3. (a) Compare between core type and shell type transformers.
   (b) Derive the emf equation of a 1-Phase transformer and calculate the emf / turn, if the flux is 0.015 wb at a frequency of 50 Hz.

4. (a) Define efficiency of a transformer. Obtain the condition for maximum efficiency.
   (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.

5. (a) With usual notation deduce the expression for starting torque of a 3-phase induction motor.
   (b) The rotor of a 3-phase induction motor has 0.04Ω resistance per phase and 0.2Ω standstill reactance per phase. What external resistance is required in the rotor circuit in order to get half of the maximum torque at starting? Neglect

stator impedance. By what percentage will this external resistance change the current and pf at starting?

6. (a) A 2-pole 3-phase alternator stator has a total of 270 armature conductors on it. The total flux per pole is 1.810^6 lines. If the frequency of the generated voltage is 50HZ, find the induced e.m.f per phase.

   (b) A 3-phase 4-pole synchronous generator has a double layer winding having four turns per coil placed in a total of 48 slots. If the flux per pole of the generator is 2×10^6 lines and speed of the rotor is 1500 r.p.m., calculate the magnitude of generated voltage per phase.

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. (a) Discuss the differences between capacitor start. Capacitor run and permanent split capacitor motors.

   (b) A small motor has an output torque of 0.25 N.m and a speed of 100 rad/sec. If the input current is 0.6 A at 230 V and 0.6 lagging p.f find

      i. output power in watts

      ii. efficiency.

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

II B.Tech. I Semester Supplementary Examinations, May -2005
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 the constructional features of a D.C. Machine with the help of a neat sketch.
   (b) Name the main parts of a D.C. Machine and state the materials of which each part is made.
   (c) Explain different methods of excitation of D.C. Generators with suitable diagrams.

2. (a) Explain the various methods of speed control of a D.C. Shunt Motor.
   (b) A 460V d.c. series motor runs at 1000rpm taking a current of 40A. Calculate the speed and percentage change in torque if the load is reduced so that the motor is taking 30A. Total resistance of the armature and field circuits is 0.8Ω. Assume flux is proportional to the field current.

3. (a) Discuss the constructional features of transformers. Draw neat diagrams.
   (b) Calculate the flux in the core of a single-phase transformer having a primary voltage of 230 V, at 50 Hz and 50 turns. If the flux density in the core is 1Tesla, calculate the net cross-sectional area of the core.

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

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. (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.

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. (a) Discuss the differences between capacitor start. Capacitor run and permanent split capacitor motors.

   (b) A small motor has an output torque of 0.25 N.m and a speed of 100 rad/sec. If the input current is 0.6 A at 230 V and 0.6 lagging p.f find

      i. output power in watts

      ii. efficiency.

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

II B.Tech. I Semester Supplementary Examinations, May -2005
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 the constructional features of a D.C. Machine with the help of a neat sketch.
   (b) Name the main parts of a D.C. Machine and state the materials of which each part is made.
   (c) Explain different methods of excitation of D.C. Generators with suitable diagrams.

2. (a) Explain the various methods of speed control of a D.C. Shunt Motor.
   (b) A 460V d.c. series motor runs at 1000rpm taking a current of 40A. Calculate the speed and percentage change in torque if the load is reduced so that the motor is taking 30A. Total resistance of the armature and field circuits is 0.8Ω. Assume flux is proportional to the field current.

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.

4. (a) Explain how the equivalent circuit parameters can be obtained from open circuit and short circuit tests.
   (b) A 300 kVA, 11000 / 440 V, single phase, 50 Hz, transformer gave the following test results. Open circuit test on LV side a normal voltage and frequency input 1.3 kW, 4 Amps; short circuit test HV side with voltage 600 V, input 2.80 kW, 15.0 amps. Calculate the efficiency and regulation for full load at 0.8 p f lagging.

5. (a) Explain why the rotor of polyphase induction motor can never attain synchronous speed.
   (b) A 10 kW, 400 V, 3-phase, 4-pole, 50 Hz delta connected induction motor is running at no load with a line current of 8 A and an input power of 660 watts. At full load, the line current is 18 A and the input power is 11.20 kW. Stator effective resistance per phase is 1.2Ω and friction, windage loss is 420 watts. For negligible rotor ohmic losses at no load, calculate,
      i. stator core loss ;

ii. total rotor losses at full load ;
iii. total rotor ohmic losses at full load ;
iv. full load speed;
v. internal torque, shaft torque and motor, efficiency.

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.

7. (a) Explain why a synchronous motor doesnt have self-starting torque. Explain one method of starting a synchronous motor.
   (b) A 3phase, 3300v, star connected synchronous motor has a synchronous reactance of 5ohm per phase. The input to the motor is 1000kw at a normal voltage and the induced line e.m.f is 4000v.Calculate the line current. Neglect armature resistance.

8. (a) Discuss the differences between capacitor start. Capacitor run and permanent split capacitor motors.
   (b) A small motor has an output torque of 0.25 N.m and a speed of 100 rad/sec. If the input current is 0.6 A at 230 V and 0.6 lagging p.f find
      i. output power in watts
      ii. efficiency.

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