Code No: RR211002 **RR**

II B.Tech I Semester(RR) Supplementary Examinations, May/June 2010
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) 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) 250 V d.c. shunt motor takes 41 A at full load. Resistances of motor armature and shunt field windings are 0.1Ω and 250Ω respectively. Find the back emf on full load. What will be its generated emf, if working as generator and supplying 41A to load at terminal voltage of 250 V? [3+3+2+8]

3. (a) Draw the equivalent circuit of a transformer and show how the constants of primary and secondary windings may be combined to give a simplified equivalent circuit with the values of constants given in terms of secondary winding.
   (b) Explain the constructional details of 1-Phase transformer. [8+8]

4. (a) Derive the condition for maximum efficiency of a transformer.
   (b) The parameters of the equivalent circuit for a 1-phase transformer are $R_0 = 400\Omega, X_0 = 231\Omega, R_t = 0.16\Omega and X_t = 0.7\Omega$. The input voltage is 200 V, and load $5.96 + j4.44\Omega$. (All values are referred to primary.) The ratio of secondary to primary turns is 10. Find the secondary terminal voltage; the primary current; and the efficiency. [6+10]

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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