Code No: NR211001 **NR**

II B.Tech I Semester Supplementary Examinations, November 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) Why brushes and commutator are necessary for operation of a D.C. Machine.
   (b) How D.C. Generators are classified?
   (c) The armature of a 6-pole d.c. generator has a wave winding containing 664 conductors. Calculate the generated e.m.f. when flux per pole is 0.06 weber and the speed is 250rpm. At what speed must the armature be driven to generate an e.m.f. of 250V if the flux per pole is reduced to 0.058 weber? [5+5+6]

2. (a) Deduce the condition for maximum efficiency of a D.C. Generator.
   (b) What do you understand by Constant losses in a D.C. Machine.
   (c) A shunt generator has a full load current of 195A at 250V. The stray losses are 720W and the shunt field coil resistance is 50Ω. It has a full load efficiency of 90%. Find the armature resistance. Also find the current corresponding to maximum efficiency. [5+3+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) 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) 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? [8+8]

6. (a) Derive an equation for emf of a three phase alternator.

   (b) A 400, 10KVA, 3 phase alternator with star connected stator winding has an effective armature resistance per phase of 1.0 ohm. The alternator generates an open circuit voltage per phase of 90 V with a field current of 1.0 A. During the short circuit test, with 1.0 A of field current, the short circuit current flowing in the armature is 15A. [8+8]
   Calculate

      i. the synchronous impendence

      ii. If the alternator is supplying a load current of 15A at 0.8 p.f lagging, to what value would the terminal voltage rise if the load is through off.

7. (a) Explain the working principle of the synchronous motor on no load and on load with the help of phasor diagrams.

   (b) A 3 phase, 44 V, 50 Hz star connected synchronous motor develops 7.4 kW. The effective resistance per phase of the stator winding is 0.5 ohm. The motor operates at power factor of 0.75 lagging. Iron and mechanical losses amount to 500W and the excitation loss is 650W. [8+8]
   Calculate

      i. armature current

      ii. efficiency of the motor.

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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