Code No: NR220402 **NR**

II B.Tech II Semester Supplementary Examinations, November/December 2005
ELECTRICAL TECHNOLOGY
(Common to Electronics & Communication Engineering, Computer Science & Engineering, Information Technology, Computer Science & Systems Engineering, Electronics & Telematics and Electronics & Computer 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) Derive an expressions for torque of a d.c. motor.
   (b) Explain how the torque of a D.C. shunt and D.C. series motor varies with the speed of the motor.
   (c) The armature resistance of a 220 V d.c. shunt motor is 0.4Ω and it takes a no-load armature current of 2 A and runs at 1,350 rpm. Find the speed when taking an armature current of 50 A if armature weakens the flux by 2%. [6+4+6]

3. (a) Draw the phasor diagram of a transformer on
      i. no load,
      ii. full load with inductive load and explain.
   (b) A 1-phase transformer is supplied 6000 V. The terminal voltage on the secondary sidewhen loaded at power factor 0.8 is 254 V. The equivalent resistance and reactance drops are 1 and 5%. Find the turn ratio. [8+8]

4. (a) Explain the O.C. and S.C. tests on the transformer and hence explain the evaluation of equivalent circuit from it.
   (b) In a 25kVA, 2000/200V transformer the iron and copper losses are 350 and 400W respectively. Calculate the efficiency on upf at [8+8]
      i. full load and
      ii. half load
      iii. Determine the load for maximum efficiency and the copper loss in this case.

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) Draw a neat sketch showing the various parts of a synchronous machine and explain each part briefly. [8]

   (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 [3]
   ii. the generated e.m.f per phase and [3]
   iii. the line e.m.f. [2]

7. (a) A 500V, 50 Hz, Single-phase synchronous motor takes 50A current at a power factor of 0.8 lagging. The motor has a synchronous reactance of 2ohm and negligible resistance. The armature has 120 full pitch coils in series, with a distribution factor of 0.95. Assuming a sinusoidal variation of flux in the air gap. Calculate the flux per pole.

   (b) Derive expressions for distribution factor and pitch factor. [8+8]

8. (a) Describe the construction and working principle of shaded pole induction motor.

   (b) Enumerate the applications of [10+6]

   i. $1-\phi$ capacitor start and run induction motor and
   ii. shaded pole induction motor.

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