Code No: NR220402 **NR**

II B.Tech II Semester Supplementary Examinations, April/May 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) Mention the reasons for compounding D.C. Generator. Neatly sketch and explain the external characteristics of a D.C. Compound Generator.
   (b) A short shunt compound generator delivers a load current of 30A at 220V and has armature, series field and shunt field resistances of $0.05\Omega, 0.03\Omega$ *and* 200Ω respectively. Calculate the induced emf and the armature current. Allow 1.0V per brush for contact drop.

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%.

3. (a) Derive the e. m. f. equation of a single-phase transformer and draw the no-load phaser diagram.
   (b) A 40 kVA transformer with ratio of 2000 / 250 V has a primary resistance of 1.15Ω and a secondary resistance of 0.0155Ω. Calculate
      i. the total resistance interms of secondary winding,
      ii. the total resistance drop on full load, and
      iii. the total copper loss on full load.

4. (a) Define regulation of a transformer. Derive the expression for the regulation.
   (b) Explain with neat circuit diagrams, the open circuit and short circuit tests to be carried out in the laboratory on a 1.5 kVA, 230 V / 40 V, 50 Hz, 1-phase transformer, for the determination of the parameters of the equivalent circuit.

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) 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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