ROLL NO.....

2007 ANDHRA UNIVERSITY

B.TECH COMPUTER SCIENCE ENGINEERING

II B.TECH I SEMESTER

ELEMENTS OF ELECTRICAL ENGINEERING

TIME: 3 HOUR
MARK: 70

- First Question Is Compulsory
- Answer Any Four From The Remaining Questions
- All Questions Carry Equal Marks
- Answer All Parts Of Any Question At One Place

1. (a) Explain the terms

(i) Magnetomotive force

(ii) Reluctance

(iii) Flux density.

(b) Explain

(i) Statically induced e.m.f.

(Give one application of each generator based on the above characteristics)

(c) Explain the significance of back e.m.f. Give its equation for a shunt motor in terms of supply voltage and armature resistance drop.

(d) In a 3-phase delta connected load, the phase current is 20 Amperes. What is the line current drawn from the supply? Give the power equation in a 3-phase circuit interms of line values.

(e) Draw the phasor diagram of 1-phase transformer when it supplies lagging power factor load.

(f) Draw the torque ship characteristic of a 3-phase induction

(i) the starting torque

(ii) pull out torque and

(iii) full load torque

(iv) Define distribution factor

2. (a) State and explain Faradays law of electromagnetic induction.

(b) A steel ring has a circular cross-section of 2 cm in diameter and mean radius of 20 cms. The ring is uniformaly wound with a coil of 500 turns. If an air of 2 mm width is made in the ring, estimate the current taken by the coil if a flux of 3500 mwb is to be produced in the gap.
The magnetization curve of the sample is obtained from the readings below:

Amp. Turns/m 200 400 600 800 1200 1400
Fluxdensity wb/m2 0.66 0.94 1.07 1.14 1.2 1.24

3. (a) Derive the e.m.f equation of a D.C. generator.

(b) A 4 pole long shunt compound generator with wave connected annature having shunt field, series field and armature resistances of 50, 0.05 and 0.1 ohm respectively, supplies sixty 100

volt, 40 watt lamps. Calculate the total armature current. the current per armature path and the generated e.rn.f Assume 1 volt drop per brush.

4. (a) Discuss the various methods of speed control of a D.C. motor.

(b) A2-pole. D.C. shunt motor operating from a 200 volts supply takes a hill load current of 35 Amps drawn from the supply. the no-load current being 2 Amps. The field resistance is 500 ohms and the annature resistance is 0.6 ohm Calcuate the efficiency of the motor on full load.

5. (a) A circuit takes a current of 3 Amps at a power factor of 0.6 lagging when connected to a 150 volts, 50 Hz supply. Another circuit takes a current of 5 Amps at a power factor of 0.8 leading when connected to the same supply. If these two circuits connected to the same supply. If these two circuits connected in series across 230 volts. 50 Hz supply. calculate the current and the power consumed.

b)Three equal impedances are delta connected to a a3-phase, 400 volts, 50 Hz supply. If the resistance and inductive reactances of each phase are 20 ohms and 30 ohms respectively. Calculate the line current drawn from the supply and the power consumed.

6. (a) Explain how is the approximate regulation of a1-phase transformer at different power factors can be predetermined by using the data obtained from short circuit test

(b) A 10 KVA, 500/250 volts. 1-phase transformer has its maximum efficiency of 94% when delivering 90% of its rated output at unity power factor. Estimate its efficiency when delivering its full load output at 0.8 p.f. lagging.

7. (a) Derive the expression for torque developed by the 3-phase induction motor from fundamentals. Hence obtain the condition for maximum torque.

(b) A3-phase, 4 pole volts, 50 Hz induction motor develops 15 H.P (Metric) at 1425 r.p.m. with a power factor of 0.8 lagging. The mechanical losses amount to 0.75 H.P. (Metric). Determine for this load, the slip, rotor copper losses and line current. Take stator losses as 1200 watts.

8. (a) Describe briefly the various methods of starting synchronous motor.

(b) A 3-phase, 16 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 30 mwb. sinusoidally distributed and the speed 375 RPM. Find the frequency and the phase and line e.m.fs of the alternator.