

B. Tech Degree III Semester Examination, December 2006

IT/CS/EC/ME/ EB/EI 302 ELECTRICAL TECHNOLOGY (1999 Admissions Onwards)

Time : 3 Hours

Maximum Marks : 100

- I. (a) Develop the exact equivalent circuit of a transformer. From this derive the approximate equivalent circuit referred to primary. (10)
- (b) A 400/200V single phase transformer is supplying a load of 50A at a power factor of 0.866 lagging. The no load current is 2A at 0.208 pf lagging. Calculate the primary current and primary power factor. (10)
- OR**
- II. (a) Explain the working of a current transformer. What are the precautions to be observed while using CT for current measurement? (6)
- (b) What are the advantages of using instrument transformers? (4)
- (c) A 10KVA 500/250V, single phase transformer gave the following test results.
SC test (HV Side) – 60V, 20A, 150W.
The maximum efficiency occurs at unity power factor and at 1.2 times full load current. Determine the full load efficiency at 0.8 power factor lagging. Also calculate the maximum efficiency. (10)
- III. (a) What is armature reaction? Discuss the effects of armature reaction. How can it be reduced? (10)
- (b) In a 220V compound generator the resistances of armature, shunt and series windings are 0.1Ω , 50Ω and 0.06Ω respectively. The load consists of 220 lamps each rated at 100W and 220V. Find the induced e.m.f. When the machine is connected as long shunt and short shunt. Allow a total brush drop of 2 volts. (10)
- OR**
- IV. (a) What is the need of starter in DC motor. With a neat sketch explain the working of a 3 point starter. (10)
- (b) A 500V shunt motor takes a total current of 5A when running unloaded. The resistance of armature is 0.25Ω and the field resistance is 125Ω . Calculate the output and efficiency when the motor is loaded and taking a current of 100A. Also find the percentage change in speed from no load to full load. (10)
- V. (a) Define voltage regulation of an alternator. (2)
- (b) What are the factors that cause a change of the alternator terminal voltage as it is loaded? Explain. (8)
- (c) Find the no load phase and line voltage of a star connected 3 phase, 6 pole alternator which runs at 1200 rpm, having flux per pole of 0.2wb sinusoidally distributed. Its stator has 54 slots having double layer winding. Each coil has 6 turns and the coil is chorded by one slot. (10)

OR

(Turn Over)

- VI. (a) Explain the principles of operation of a synchronous motor. (8)
 (b) What is the effect of increased load on a synchronous motor under condition of normal, under and over excitation? (8)
 (c) What is a synchronous condenser? Explain. (4)
- VII. (a) Explain why an induction motor is called a generalized transformer. (7)
 (b) A 3 phase 6 pole, 50HZ induction motor has a full load speed of 960r.p.m. Find the speed of stator field with respect to
 (i) Stator structure (ii) Rotor structure
 (iii) Rotor field. (3)
 (c) A 4 pole, 50HZ induction motor has a rotor impedance of $0.03 + j0.12 \Omega$ per phase at stand still. Find the resistance to be added in the rotor circuit to obtain 75% of maximum torque at starting. What is the speed at maximum torque. (10)
- OR**
- VIII. (a) Derive from first principles the relation between the power transferred to rotor, mechanical power developed and copper loss in the rotor of a induction motor. (10)
 (b) Discuss the principle of operation of single phase induction motor using double field revolving theory. (10)
- IX. (a) With necessary schematic diagram explain the working of a thermal power plant. (10)
 (b) What do you mean by skin effect? How will it effect the transmission? How is it reduced? (10)
- OR**
- X. (a) Compare the working of steam power plant, hydroelectric power plant and nuclear power plant. (10)
 (b) (i) What is the need of substation in power system? (6)
 (ii) What is the utility of instrument transformers in substation? (4)

