

328412(24)

B. E. (Fourth Semester) Examination,  
Nov./Dec., 2007

(AEE, E., ET & T Engg. Branch)

**ELECTRICAL MACHINES**

*Time Allowed : Three hours*

*Maximum Marks : 80*

*Minimum Pass Marks : 28*

*Note : Part (a) of each unit is compulsory. Attempt questions worth 16 marks from each unit.*

1. (a) Give expressions for the following: 2
- (i) Generated emf. in D.C. Generator
  - (ii) Developed torque in D.C. Motors
- (b) Explain the operating characteristics of D.C. shunt generator. 7

328412 (24)

PTO

121

- (c) Explain three point starter for D.C. Motors. 7
  - (d) A 2000 V d.c. series motor runs at 1000 rpm and takes 20 amperes. Combined resistance of armature and field is 0.4 ohms. Calculate the resistance to be inserted in series so as to reduce the speed to 800 rpm, assuming torque to vary as square of the speed and linear magnetization curve. 7
2. (a) (i) Give the expression of induced voltage in single phase transformer. 7
- (ii) Draw the wave forms of applied voltage in primary side, exciting current, flux and output voltage at no load in ideal transformer.
- (b) Describe the various connections for three phase transformers 7
- (c) Calculate the regulation of a transformer in which ohmic loss is 1% of the output and the reactance drop is 0.5% of the voltage when the power factor is
- (i) 0.8 leading
  - (ii) unity
  - (iii) 0.8 leading 7
- (d) Derive the condition for maximum efficiency of a single phase transformer. Also derive the expression of KVA load at which maximum efficiency occurs. 7

131

3. (a) Name the two types of rotor construction used in an alternator. 2
- (b) Derive the expression of generated E.M.F. of an alternator. 7
- (c) A 3 phase, 50 Hz, 8 pole alternator has a star connected winding with 120 slots and 8 conductors per slot. The flux per pole is 0.95 wb, sinusoidally distributed. Determine the phase and line voltages. 7
- (d) Define voltage regulation of an alternator. Explain the synchronous impedance method of computing the voltage regulation of an alternator. 7
4. (a) Give the expression of slip and time frequency of a three phase induction motor. 7
- (b) Describe the construction of a three phase induction motor. 7
- (c) Derive the relationship for torque developed by a three phase induction motor. Draw and explain a typical torque slip characteristics. 7
- (d) A cage induction motor has a short circuit current of four times the full load value and has a full load slip of 0.05. Determine a suitable autotransformer ratio if the supply current is not to exceed twice the full load current. Determine also the starting torque in terms of the full load torque. 7

5. (a) Give two advantages of synchronous motor over induction motor. 2
- (b) Explain the working principle of a servomotor. Also give its applications. 7
- (c) Explain the working principle of synchronous motors. 7
- (d) Name the starting methods used in single phase induction motor, and explain any two in detail. 7