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Total number of printed pages – 2

B. Tech

FEEE 2215 / BEEE 2215 (New)

Special Examination – 2012

ENERGY CONVERSION TECHNIQUES

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any **five** from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10
 - (a) Draw the speed-armature current characteristic of dc series motor.
 - (b) What are the conditions to be fulfilled for a dc machine to self excite ?
 - (c) The load current and flux of a separately excited dc motor are kept constant. If the supply voltage is increased by 20%, how will be its speed affected ?
 - (d) How can eddy current loss in a transformer be minimized ?
 - (e) What is the synchronous speed of a 720 rpm, 4 kW, 3 phase induction machine ?
 - (f) If the rotor circuit resistance of a 3 phase wound rotor induction machine is increased, what will be its effect on the maximum torque of the machine ?
 - (g) Why single phase induction motors do not have starting torque ?
 - (h) What is synchronous reactance of alternator ?
 - (i) What are the two important functions served by damper winding in a synchronous motor ?
 - (j) Give the application of synchronous motor.
2.
 - (a) What effect does the speed of a self excited generator have on the buildup of voltage ? Explain. 4
 - (b) A dc shunt generator gives full load output of 30 kW at a terminal voltage of 200V. The armature and shunt field resistances are 0.05Ω and 50Ω respectively. The iron and friction losses are 1000 W. Calculate 6
 - (i) generated emf
 - (ii) copper losses
 - (iii) efficiency.
3.
 - (a) Draw and explain the speed torque and speed armature current characteristics of dc shunt motor. 4

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- (b) A 250V shunt motor on no load runs at 1000 rpm and takes 5A. The total armature and shunt field resistance are 0.2Ω and 250Ω respectively. Calculate the speed when loaded and taking a current of 50A, if the armature reaction weakens the field flux by 3%. 6
4. (a) Explain why the short circuit test on a transformer minimizes the core losses? 4
- (b) A single phase 30 kVA transformer has the following data : 6
 Number of turns in the primary winding = 300
 Number of turns in the secondary winding = 50
 Supply to the primary winding is 1600 V, 50 Hz
 Calculate :
 (i) The emf induced in the secondary winding
 (ii) The primary current
 (iii) The maximum flux in the core.
5. (a) Explain the rotor resistance method of speed control for three phase wound rotor induction motor. 4
- (b) The power input to the rotor of a three phase induction motor is 50 kW. The motor runs at 950 rpm. The number of poles is 6. The frequency of supply is 50 Hz. The rotor resistance per phase is 0.3Ω . Determine the rotor current per phase. 6
6. (a) Draw and explain the power angle curve of three phase alternator. 4
- (b) A 3-phase, 11 kV star connected alternator supplies a load of 10 MW at power factor of 0.85 lagging. Calculate the generated voltage if the armature resistance is 0.1Ω per phase and the synchronous reactance is 0.66Ω per phase. 6
7. (a) Draw the phasor diagram of synchronous motor and explain it. 4
- (b) A 2550 V, three phase, 4-pole, star connected synchronous motor is running at 1500 rpm. The excitation corresponding to the open circuit voltage of 2550 V is kept constant. The synchronous reactance is 0.35Ω per phase. Neglect the resistance. Determine the power input, the power factor and the torque developed for an armature current of 260 A. 6
8. Write short notes on any **two** : 5 × 2
- (a) Speed control of separately excited dc motor
- (b) Open circuit test on transformer
- (c) Starting of three phase squirrel cage induction motor
- (d) Equivalent circuit of three phase alternator.