Registration No. : | | | | | | | | | | |

Total number of printed pages – 3

B. Tech

PCEL 4302

Fifth Semester Regular Examination – 2014

ELECTRICAL MACHINES - II

BRANCH(S) : EEE, ELECTRICAL

QUESTION CODE : H 165

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) Differentiate between the salient pole and non salient pole synchronous machine.

(b) Why voltage regulation of an alternator is negative for a leading power factor load ?

(c) If excitation of 3-phase synchronous alternator (with constant steam input) supplying a lagging power factor load is increased, what will happen to power angle and power factor ?

(d) Define short circuit ratio of an alternator.

(e) Write two advantages of short pitched coils in the armature winding in an AC machine.

(f) What is open-Delta connection in a three phase transformer ? How it affects the rating of the transformer ?

(g) Explain why load angle 'delta' is positive for synchronous generator and negative for in case of synchronous motor ?

(h) Draw the phasor diagram for a synchronous motor on no load.

(i) How the third harmonic problem of Y-Y connected three phase transformer can be solved ?

(j) Mention two practical application of stepper motor.

2. (a) A 3-phase, 10 kVA, 440 V, 50 Hz star connected alternator supplies the rated load at 0.8 p.f lagging. If the armature resistance is 0.5 Ω and synchronous reactance is 10 Ω. Find the torque angle and voltage regulation. 5

(b) Explain and derive the expression for distribution factor (k_d) for an alternator by drawing suitable diagram. 5

3. (a) A 3-phase, 50 Hz star connected armature winding of a generator has 6 slots per pole per phase. The pole pitch is 10 slot and the coil pitch is 9 slots. The winding is double layer and has 30 turns per phase. If the air gap flux is sinusoidally distributed, what must be its maximum value to give 600 V across the line ? 5

(b) Explain why is synchronous motor not self starting ? Describe one method used to start synchronous motor. 5

4. (a) Draw the physical connection and phasor diagrams for the transformer connections (i) Yd 1, (ii) Yz 11. 5

(b) A 3-phase, 1200 kVA, 6600 V/1100 V transformer is delta connected on the primary and star connected in secondary. The primary resistance/phase 0.025 Ω. Determine the efficiency on full load at unity power factor and 0.8 power factor if the iron loss is 20 kW. 5

5. (a) A 400 V, 8 kW, 3-phase synchronous motor has negligible resistance and synchronous reactance of 8 Ω/phase. Determine the minimum current and the corresponding induced e.m.f for full load condition assuming an efficiency of 90%. 5

(b) What is 'Reluctance Power' in case of a salient pole three phase synchronous generator with negligible stator resistance ? Explain by writing its power angle equation and drawing its power angle characteristic. 5

6. (a) Two single-phase electric furnaces working at 100 V are connected to a 3300 V, 3-phase supply through Scott connected transformers. Determine the currents in the three phase lines when the power taken by each furnace is 500 kW at a power factor of 0.8 lagging ? (Neglect transformer losses) 5

(b) What are the conditions required for paralleling ? Explain also general procedure for paralleling 3-phase synchronous generators. 5

7. (a) Draw the circuit diagram of a capacitor start capacitor run single-phase induction motor and explain its working. 5

(b) Why the developed torque in case of a single phase induction motor is negative at synchronous speed ? Explain by drawing its torque speed characteristic. 5

8. Write short notes on any **two** : 5×2

(a) Voltage regulation of alternator by ZPF method

(b) Parallel operation of three phase transformers

(c) Universal motor.