4E 4175

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B.Tech. IV Semester (Main/Back) Examination, June/July - 2015

Electrical Engineering

4EE5A Electrical Machines-II

Common to EE and EX

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 26

Instructions to Candidates:

*Attempt any **five** questions, selecting **one** question from **each unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Unit - I

1. a) Derive the emf equation of an AC machine having short pitched and distributed armature winding of three phases. **(8)**

   b) A 3-phase , 50-Hz , 2- pole, star connected turbo alternator has 54 slots with 4 conductors per slot. The coils are short pitched by 2 slots less than the pole pitch. If the machine gives 3300 v between lines on open circuit with sinusoidal flux distribution , determine the useful flux per pole **(8)**

OR

1. a) Explain how the rotating magnetic field is developed in AC machines **(6)**

   b) Explain how the electromechanical energy conversion takes place in AC machines? **(6)**

   c) What are the essential conditions for development of torque in AC machines? **(4)**

Unit - II

2. a) Draw the torque-slip characteristic of a 3-phase induction motor and explain it. Find condition of maximum torque. Show the effect of rotor resistance on torque slip characteristic. **(8)**

   b) A 10-hp, 4-pole, 50-Hz, 3-phase induction motor runs at 1450 rpm on full load. The stator copper loss is 231 W and the rotational loss is 343 W. Determine (I) shaft torque (II) mechanical power developed(III) air gap power(IV) rotor copper loss and (V) motor efficiency **(8)**

OR

2. a) The test data on a 3-phase star connected induction motor is given below-
No load test:
Line to line voltage = 400V,
Input power = 1720 W
Input current = 18A
Friction and windage loss = 580 W
Block rotor test; line to line voltage=50V
Input power = 2500 W
Input current == 60A
Determine the equivalent circuit parameters if stator resistance is 0.15 Ω per phase **(8)**

b) Explain the problems of cogging and crawling in induction motors. How these are removed **(8)**

Unit - III

3. a) Draw the equivalent circuit of a single phase induction motor and explain its working principle **(8)**

b) Explain the working of universal motor **(8)**

OR

3. a) Explain the double revolving field theory of single phase induction motor **(8)**

b) Describe the working of stepper motor with its diagram **(8)**

Unit - IV

4. a) Draw the phasor diagram for lagging power factor and derive the output power equation of a salient pole synchronous generator. Also draw its power angle characteristic **(12)**

b) What are the benefits of having rotating field system in large size synchronous generators? **(4)**

OR

4. a) Draw the equivalent circuit of a synchronous generator. Also draw the phasor diagram for leading power factor current supplied by generator and write voltage balance equations **(10)**

b) A 3-phase, 10 KVA, 400V,50Hz star connected alternator supplies the rated load at 0.8 power factor lagging. If the armature resistance is 0.5 Ω and synchronous reactance is 10 Ω, find the torque angle and voltage regulation **(6)**

Unit - V

5. a) What is hunting of synchronous machines and how it can be eliminated. **(8)**

   b) With the help of phasor diagram show the power factor control of synchronous motor through change of excitation **(8)**

OR

5. a) Explain working of synchronous condenser with its phasor diagram. **(8)**

   b) Draw and explain V-curves of a synchronous motor at different loads **(8)**
