4E 4175

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B.Tech. IV Semester (Main/Back) Examination, May 2018
Electrical Engg.
4EE5A Electrical Machines - II
EE,EX

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

Min. Passing Marks : 26

*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 general equation of induced emf. What are the effect of the Harmonics in generated emf. **(8)**

   b) Calculate the rms value of the induced emf per phase of a 10-pole,3-phase, 50Hz alternator with two slots per pole per phase and 4 conductor per slot in two layers. The coil span is 15^0. The flux per pole has a fundamental component of 0.12 wb and a 20 percent of third harmonic component. **(8)**

OR

1. a) Define chording factor and breadth factor for Ac armature winding. Derive expression for breadth factor. **(8)**

   b) A 3 phase, 50Hz, 2 pole star connected turbo alternator has 54 slots with 4 conductors per slot.The pitch of the coil is 2 slot less than the pole pitch. If machine gives 3.3 Kv between lines on open circuit with sinusoidal flux distribution. Determine the useful flux per pole. **(8)**

Unit - II

2. a) Why 3-phase induction motor does not run at synchronous speed?**(3+3+3+7)**

   b) Why is the no load current drawn by 3-phase induction motor so high?

   c) Define slip of induction motor.

   d) A 3-phase, 3 pole, 50 Hz star connected induction motor delivers useful power 25 Kv while running at a speed of 950 rpm. It is connected to a supply of 400 volt and takes 60A current. Its stator resistance per phase is 0.14Ω mechanical losses are 900w.

Calculate

(i) Shaft torque

(ii) Gross torque developed

(iii) Rotor cu loss

(iv) Stator cu loss

(v) Overall efficiency. The p.f of motor is 0.75 (lagging).

OR

2. a) Discuss the principle of operation of 3 phase induction motor. How induction motor acts as transformer. http://www.rtuonline.com (8)

b) A 3 phase, 6 pole, 50 Hz induction motor has a slip of 1% at no-load and 3% at full load. Determine

i) Synchronous speed.

ii) No load speed.

iii) Full load speed.

iv) Frequency of rotor current at stand still. (8)

UNIT - III

3. a) Describe the constructional feature and principle of operation of a Universal motor. Draw its speed load characteristic. (8)

b) A universal series motor has a resistance of 30Ω and an inductance of 1.5H. When connected to a 250v d.c. Supply and loaded to take 0.8A. It runs at 2000 rpm. Estimate its speed and power factor when connected to a 250v, 50 Hz A.C. Supply and loaded to take same current. (8)

OR

3. a) Describe the single phase synchronous motor. (8)

b) A 230v, 380w,50Hz,4pole,1-phase, induction motor gave the following test results.

No load test:	230v	84w	2.8A
Block rotor test:	110v	460w	6.2A

The stator winding resistance is 4.6 ohm and during the block rotor test, the auxiliary winding is open. Determine the equivalent circuit parameter. (8)

UNIT-IV

4. a) What are the conditions to be full filled for parallel operation of two synchronous machines? Explain any one method of synchronizing. (8)

b) Two identical, 3-phase alternators operating in parallel share equally a load of 1000 kw at 6600v and 0.8 lagging p.f. The field excitation of the first machine is adjusted so that the armature current is 50A at lagging p.f. (8)

Determine:

i) The armature current of the second alternator.

ii) The p.f. at which each machine operates.

OR

4. a) Explain construction, excitation and principle of Synchronous Generator. **(8)**

b) A 3-phase, 10KVA, 400v, 50Hz, star connected alternator supplies the rated load at 0.8 p.f. lag. If armature resistance is 0.5 ohm and synchronous reactance is 10 ohms, find the power angle and voltage regulation. **(8)**

UNIT-V

5. a) Show that a synchronous motor has no net starting torque. Describe the methods of starting the synchronous motor. http://www.rtuonline.com **(8)**

b) A 3-phase, 18MVA,10pole, 50Hz,11KV star connected synchronous motor has $X_d = 5\Omega$ and $Xq = 3\Omega$ respectively. It has negligible armature resistance calculate the following on full load at 0.8 p.f. lagging.

i) The excitation voltage.

ii) The power

iii) The maximum value of power angle and the corresponding power. **(8)**

OR

5. a) Discuss the effects of varying excitation on armature current and power factor in a synchronous motor. http://www.rtuonline.com **(8)**

b) The excitation of a 415v, 3-phase,mesh-connected synchronous motor is such that the induced emf is 520v. The impedance per phase is (0.5+j 4.0) ohm. If the friction and iron losses are constant at 1000W, Calculate the power output, line current, power factor and efficiency for maximum power output. **(8)**
