Code No: R05310204 **R05** **Set No. 2**

**III B.Tech I Semester Examinations,November 2010**
**ELECTRICAL MACHINES-III**
**Electrical And Electronics Engineering**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

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1. (a) A 50 Hz, 3-Φ, 480 V, delta connected salient pole synchronous generator has $\times_d = 0.1\ \Omega$, $\times_q = 0.075\ \Omega$. The generator is supplying 1200 A at 0.8 pf lagging. Find the excitation EMF. Neglect armature resistance.
   (b) Explain the '*slip test*' method of finding $\times_d$ & $\times_q$ of a salient pole alternator. [8+8]

2. (a) Explain the effects of harmonics on the performance (EMF) of an alternator.
   (b) Find the RMS value of fundamental & third harmonic EMF per phase for an alternator having following data: 50 Hz, 3-Φ, 6 poles, 3 slots/pole/phase, double layer winding with 6 conductors/slot, coil span of $150^o$, flux per pole: fundamental is 0.078 wb and third harmonic 13 % of fundamental. All coils of a phase are connected in series. [8+8]

3. (a) Compare AC series motor & Universal motor.
   (b) Compare variable reluctance stepper motor & permanent magnet stepper motor. [8+8]

4. (a) With neat diagram explain how damper winding helps in starting of synchronous motor. Explain any other uses/benefits of using damper winding.
   (b) A 5.5 MVA, 50 Hz, 3-Φ synchronous generator having a synchronous reactance of 0.3 pu is running at 1500 RPM and is excited to give 11 kV. If the rotor deviated $1^o$ mechanical from its equilibrium position, what is synchronizing torque? [8+8]

5. (a) Obtain the expression for the RMS value of EMF induced in an alternator.
   (b) An alternator is operating at no load has an induced EMF of 346.4 V/ph and a frequency of 60 Hz. If the pole flux is deceased by 15 % & the speed is increased by 6.8 %; determine [8+8]
      i. The induced EMF
      ii. Frequency.

6. (a) With neat diagram explain the 'constant load with variable excitation' operation of synchronous motor.
   (b) A 3-Φ, 6.6 kV, star connected synchronous motor delivers 346.375 kW at full load having full load efficiency of 85 %. The effective armature resistance and synchronous reactance per phase of the motor are 0.4 Ω & 4.2 Ω respectively. If the motor works at 0.8 pf leading on full load, calculate the following: [8+8]

i. Generated EMF/ph
ii. Load angle.

7. (a) A 230 V, 50 Hz, 6 pole, single phase Induction motor has the following constant.
Stator resistance = 0.12 Ω
Rotor resistance = 0.14 Ω,
Magnetising reactance = 15 Ω,
Stator reactance = 0.25 Ω,
Rotor reactance = 0.25 Ω
Core loses = 250 W, friction & windage loss = 500 W, determine the efficiency and torque at 5% slip.

(b) Explain how the pulsating torque of a single phase Induction motor may be considered equivalent to two oppositely rotating fields. [8+8]

8. (a) Explain how alternators working in parallel share a load, if their electrical speeds are not same.

(b) A 25 MVA, 6.6 kV, 50 Hz, 4 pole alternator has pu armature resistance of 0.004 and synchronous reactance of 0.67 pu, when the machine is supplying rated current at rated voltage, the induced EMF is 1.5 pu. Find the torque angle & load power factor. [8+8]

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Code No: R05310204 **R05** **Set No. 4**

**III B.Tech I Semester Examinations,November 2010**
**ELECTRICAL MACHINES-III**
**Electrical And Electronics Engineering**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

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1. (a) Explain how alternators working in parallel share a load, if their electrical speeds are not same.
   (b) A 25 MVA, 6.6 kV, 50 Hz, 4 pole alternator has pu armature resistance of 0.004 and synchronous reactance of 0.67 pu, when the machine is supplying rated current at rated voltage, the induced EMF is 1.5 pu. Find the torque angle & load power factor. [8+8]

2. (a) A 50 Hz, 3-Φ, 480 V, delta connected salient pole synchronous generator has $\times_d = 0.1\ \Omega$, $\times_q = 0.075\ \Omega$. The generator is supplying 1200 A at 0.8 pf lagging. Find the excitation EMF. Neglect armature resistance.
   (b) Explain the '*slip test*' method of finding $\times_d$ & $\times_q$ of a salient pole alternator. [8+8]

3. (a) Compare AC series motor & Universal motor.
   (b) Compare variable reluctance stepper motor & permanent magnet stepper motor. [8+8]

4. (a) Explain the effects of harmonics on the performance (EMF) of an alternator.
   (b) Find the RMS value of fundamental & third harmonic EMF per phase for an alternator having following data: 50 Hz, 3-Φ, 6 poles, 3 slots/pole/phase, double layer winding with 6 conductors/slot, coil span of $150^o$, flux per pole: fundamental is 0.078 wb and third harmonic 13 % of fundamental. All coils of a phase are connected in series. [8+8]

5. (a) A 230 V, 50 Hz, 6 pole, single phase Induction motor has the following constant.
   Stator resistance = 0.12 Ω
   Rotor resistance = 0.14 Ω,
   Magnetising reactance = 15 Ω,
   Stator reactance = 0.25 Ω,
   Rotor reactance = 0.25 Ω
   Core loses = 250 W, friction & windage loss = 500 W, determine the efficiency and torque at 5% slip.
   (b) Explain how the pulsating torque of a single phase Induction motor may be considered equivalent to two oppositely rotating fields. [8+8]

6. (a) Obtain the expression for the RMS value of EMF induced in an alternator.

(b) An alternator is operating at no load has an induced EMF of 346.4 V/ph and a frequency of 60 Hz. If the pole flux is deceased by 15 % & the speed is increased by 6.8 %; determine [8+8]

i. The induced EMF

ii. Frequency.

7. (a) With neat diagram explain the 'constant load with variable excitation' operation of synchronous motor.

(b) A 3-Φ, 6.6 kV, star connected synchronous motor delivers 346.375 kW at full load having full load efficiency of 85 %. The effective armature resistance and synchronous reactance per phase of the motor are 0.4 Ω & 4.2 Ω respectively. If the motor works at 0.8 pf leading on full load, calculate the following: [8+8]

i. Generated EMF/ph

ii. Load angle.

8. (a) With neat diagram explain how damper winding helps in starting of synchronous motor. Explain any other uses/benefits of using damper winding.

(b) A 5.5 MVA, 50 Hz, 3-Φ synchronous generator having a synchronous reactance of 0.3 pu is running at 1500 RPM and is excited to give 11 kV. If the rotor deviated $1^o$ mechanical from its equilibrium position, what is synchronizing torque? [8+8]

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Code No: R05310204 **R05** **Set No. 1**

**III B.Tech I Semester Examinations,November 2010**
**ELECTRICAL MACHINES-III**
**Electrical And Electronics Engineering**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

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1. (a) Obtain the expression for the RMS value of EMF induced in an alternator.
   (b) An alternator is operating at no load has an induced EMF of 346.4 V/ph and a frequency of 60 Hz. If the pole flux is deceased by 15 % & the speed is increased by 6.8 %; determine [8+8]
      i. The induced EMF
      ii. Frequency.

2. (a) A 50 Hz, 3-Φ, 480 V, delta connected salient pole synchronous generator has $\times_d = 0.1\ \Omega$, $\times_q = 0.075\ \Omega$. The generator is supplying 1200 A at 0.8 pf lagging. Find the excitation EMF. Neglect armature resistance.
   (b) Explain the '*slip test*' method of finding $\times_d$ & $\times_q$ of a salient pole alternator. [8+8]

3. (a) With neat diagram explain how damper winding helps in starting of synchronous motor. Explain any other uses/benefits of using damper winding.
   (b) A 5.5 MVA, 50 Hz, 3-Φ synchronous generator having a synchronous reactance of 0.3 pu is running at 1500 RPM and is excited to give 11 kV. If the rotor deviated $1^o$ mechanical from its equilibrium position, what is synchronizing torque? [8+8]

4. (a) A 230 V, 50 Hz, 6 pole, single phase Induction motor has the following constant.
      Stator resistance = 0.12 Ω
      Rotor resistance = 0.14 Ω,
      Magnetising reactance = 15 Ω,
      Stator reactance = 0.25 Ω,
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      Core loses = 250 W, friction & windage loss = 500 W, determine the efficiency and torque at 5% slip.
   (b) Explain how the pulsating torque of a single phase Induction motor may be considered equivalent to two oppositely rotating fields. [8+8]

5. (a) Explain how alternators working in parallel share a load, if their electrical speeds are not same.
   (b) A 25 MVA, 6.6 kV, 50 Hz, 4 pole alternator has pu armature resistance of 0.004 and synchronous reactance of 0.67 pu, when the machine is supplying rated current at rated voltage, the induced EMF is 1.5 pu. Find the torque angle & load power factor. [8+8]

6. (a) With neat diagram explain the 'constant load with variable excitation' operation of synchronous motor.

   (b) A 3-Φ, 6.6 kV, star connected synchronous motor delivers 346.375 kW at full load having full load efficiency of 85 %. The effective armature resistance and synchronous reactance per phase of the motor are 0.4 Ω & 4.2 Ω respectively. If the motor works at 0.8 pf leading on full load, calculate the following: [8+8]

      i. Generated EMF/ph

      ii. Load angle.

7. (a) Compare AC series motor & Universal motor.

   (b) Compare variable reluctance stepper motor & permanent magnet stepper motor. [8+8]

8. (a) Explain the effects of harmonics on the performance (EMF) of an alternator.

   (b) Find the RMS value of fundamental & third harmonic EMF per phase for an alternator having following data: 50 Hz, 3-Φ, 6 poles, 3 slots/pole/phase, double layer winding with 6 conductors/slot, coil span of $150^o$, flux per pole: fundamental is 0.078 wb and third harmonic 13 % of fundamental. All coils of a phase are connected in series. [8+8]

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Code No: R05310204 **R05** **Set No. 3**

**III B.Tech I Semester Examinations,November 2010**
**ELECTRICAL MACHINES-III**
**Electrical And Electronics Engineering**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

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1. (a) Compare AC series motor & Universal motor.
   (b) Compare variable reluctance stepper motor & permanent magnet stepper motor. [8+8]
2. (a) A 50 Hz, 3-Φ, 480 V, delta connected salient pole synchronous generator has $\times_d = 0.1\ \Omega$, $\times_q = 0.075\ \Omega$. The generator is supplying 1200 A at 0.8 pf lagging. Find the excitation EMF. Neglect armature resistance.
   (b) Explain the '*slip test*' method of finding $\times_d$ & $\times_q$ of a salient pole alternator. [8+8]
3. (a) With neat diagram explain the 'constant load with variable excitation' operation of synchronous motor.
   (b) A 3-Φ, 6.6 kV, star connected synchronous motor delivers 346.375 kW at full load having full load efficiency of 85 %. The effective armature resistance and synchronous reactance per phase of the motor are 0.4 Ω & 4.2 Ω respectively. If the motor works at 0.8 pf leading on full load, calculate the following: [8+8]
      i. Generated EMF/ph
      ii. Load angle.
4. (a) Obtain the expression for the RMS value of EMF induced in an alternator.
   (b) An alternator is operating at no load has an induced EMF of 346.4 V/ph and a frequency of 60 Hz. If the pole flux is deceased by 15 % & the speed is increased by 6.8 %; determine [8+8]
      i. The induced EMF
      ii. Frequency.
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Core loses = 250 W, friction & windage loss = 500 W, determine the efficiency and torque at 5% slip.

(b) Explain how the pulsating torque of a single phase Induction motor may be considered equivalent to two oppositely rotating fields. [8+8]

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