Code No: RR220205 **RR** **Set No. 2**

II B.Tech II Semester Examinations,December 2010
ELECTROMECHANICS - II
Electrical And Electronics Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. A 10KW, 415V, 4-pole, 3-phase star connected induction motor gave the following test results.
   No load test: 415V, 8A, 1200 watt
   Blocked rotor test : 200V, 45A, 7000 watt
   Stator and rotor ohmic losses are equal at stand still. Draw circle diagram and find efficiency and speed at half full load. [8+8]

2. (a) Discuss the points of similarities between a transformer and an induction machine. Hence, explain why an induction machine is called a generalized transformer.
   (b) Explain why an induction motor, at noload, operates at a very low power factor. [8+8]

3. (a) Explain various losses and derive the condition for minimum efficiency of a transformer .
   (b) The efficiency at unity power factor of 6600/384 volts 100 KVA 50 Hz single phase transformer is 98% both at full load and at half full load. The power factor on no load is 0.2 and the full load regulation at a lagging power factor of 0.8 is 4 %. Draw the equivalent circuit referred to L.V. side and insert all the values. [6+10]

4. (a) What are the conditions required for the parallel operation of two transformers.
   (b) Derive the equations for the currents supplied by each transformer when two transformers are operating in parallel with equal voltage ratios. [6+10]

5. (a) Explain the procedure to predetermine the efficiency and regulation of a transformer with all necessary equations. (need not explain test procedures if any)
   (b) The iron losses in a transformer core at normal flux density were measured at frequencies of 30 and 50Hz and the results being 34W and 55W respectively. Calculate the hysteresis and eddy current losses at 50Hz. [8+8]

6. (a) Explain the functions of the following in a transformer
      i. Breather [2]
      ii. Conservator [2]
      iii. Oil [2]
   (b) Draw and explain phasor diagram of transformer on lagging load. [4+6]

7. (a) With the help of rotor equivalent circuit of an induction motor, show that the power transferred magnetically from stator to rotor is given by $\frac{I_2^2 r_2}{s}$ per phase.

   (b) Explain the terms air gap power P_g, internal mechanical power developed Pm and shaft power Psh. How are these terms are related with each other? Hence show that Pg : rotor ohmic loss : P_m = l; s : 1-s. [8+8]

8. (a) A 3-phase, 4 pole, 50 Hz, squirrel cage Induction motor has rotor leakage impedance of 1 + j2 Ω/ph, stand still voltage of 100V per phase driving a constant torque load at 0.03 slip. What is speed of the motor, if

      i. supply voltage in increased by 25% and frequency is constant.

      ii. supply voltage in increased by 25% and frequency is decreased by 25%

   (b) A 3-phase, 400V, 6-pole, 50HZ, 960 rpm slip ring induction motor has rotor resistance of 0.1 ohm per phase and leakage reactance of 0.5 ohm per phase. The load torque is independent of the speed. [8+8]

      i. Calculate the speed of motor if 0.05 ohm is inserted in the rotor circuit.

      ii. What is the maximum external resistance that can be inserted in the rotor and corresponding speed.

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR220205 **RR** **Set No. 4**

II B.Tech II Semester Examinations,December 2010
ELECTROMECHANICS - II
Electrical And Electronics Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Explain various losses and derive the condition for minimum efficiency of a transformer .
   (b) The efficiency at unity power factor of 6600/384 volts 100 KVA 50 Hz single phase transformer is 98% both at full load and at half full load. The power factor on no load is 0.2 and the full load regulation at a lagging power factor of 0.8 is 4 %. Draw the equivalent circuit referred to L.V. side and insert all the values. [6+10]

2. (a) What are the conditions required for the parallel operation of two transformers.
   (b) Derive the equations for the currents supplied by each transformer when two transformers are operating in parallel with equal voltage ratios. [6+10]

3. (a) With the help of rotor equivalent circuit of an induction motor, show that the power transferred magnetically from stator to rotor is given by $\frac{I_2^2 r_2}{s}$ per phase.
   (b) Explain the terms air gap power P_g, internal mechanical power developed Pm and shaft power Psh. How are these terms are related with each other? Hence show that Pg : rotor ohmic loss : P_m = l; s : 1-s. [8+8]

4. (a) Explain the functions of the following in a transformer
      i. Breather [2]
      ii. Conservator [2]
      iii. Oil [2]
   (b) Draw and explain phasor diagram of transformer on lagging load. [4+6]

5. (a) Explain the procedure to predetermine the efficiency and regulation of a transformer with all necessary equations. (need not explain test procedures if any)
   (b) The iron losses in a transformer core at normal flux density were measured at frequencies of 30 and 50Hz and the results being 34W and 55W respectively. Calculate the hysteresis and eddy current losses at 50Hz. [8+8]

6. A 10KW, 415V, 4-pole, 3-phase star connected induction motor gave the following test results.
   No load test: 415V, 8A, 1200 watt
   Blocked rotor test : 200V, 45A, 7000 watt
   Stator and rotor ohmic losses are equal at stand still. Draw circle diagram and find efficiency and speed at half full load. [8+8]

7. (a) Discuss the points of similarities between a transformer and an induction machine. Hence, explain why an induction machine is called a generalized transformer.

   (b) Explain why an induction motor, at noload, operates at a very low power factor. [8+8]

8. (a) A 3-phase, 4 pole, 50 Hz, squirrel cage Induction motor has rotor leakage impedance of 1 + j2 Ω/ph, stand still voltage of 100V per phase driving a constant torque load at 0.03 slip. What is speed of the motor, if

      i. supply voltage in increased by 25% and frequency is constant.

      ii. supply voltage in increased by 25% and frequency is decreased by 25%

   (b) A 3-phase, 400V, 6-pole, 50HZ, 960 rpm slip ring induction motor has rotor resistance of 0.1 ohm per phase and leakage reactance of 0.5 ohm per phase. The load torque is independent of the speed. [8+8]

      i. Calculate the speed of motor if 0.05 ohm is inserted in the rotor circuit.

      ii. What is the maximum external resistance that can be inserted in the rotor and corresponding speed.

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR220205 **RR** **Set No. 1**

II B.Tech II Semester Examinations,December 2010
ELECTROMECHANICS - II
Electrical And Electronics Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) With the help of rotor equivalent circuit of an induction motor, show that the power transferred magnetically from stator to rotor is given by $\frac{I_2^2 r_2}{s}$ per phase.
   (b) Explain the terms air gap power P_g, internal mechanical power developed Pm and shaft power Psh. How are these terms are related with each other? Hence show that Pg : rotor ohmic loss : P_m = l; s : 1-s. [8+8]

2. A 10KW, 415V, 4-pole, 3-phase star connected induction motor gave the following test results.
   No load test: 415V, 8A, 1200 watt
   Blocked rotor test : 200V, 45A, 7000 watt
   Stator and rotor ohmic losses are equal at stand still. Draw circle diagram and find efficiency and speed at half full load. [8+8]

3. (a) What are the conditions required for the parallel operation of two transformers.
   (b) Derive the equations for the currents supplied by each transformer when two transformers are operating in parallel with equal voltage ratios. [6+10]

4. (a) A 3-phase, 4 pole, 50 Hz, squirrel cage Induction motor has rotor leakage impedance of 1 + j2 Ω/ph, stand still voltage of 100V per phase driving a constant torque load at 0.03 slip. What is speed of the motor, if
      i. supply voltage in increased by 25% and frequency is constant.
      ii. supply voltage in increased by 25% and frequency is decreased by 25%
   (b) A 3-phase, 400V, 6-pole, 50HZ, 960 rpm slip ring induction motor has rotor resistance of 0.1 ohm per phase and leakage reactance of 0.5 ohm per phase. The load torque is independent of the speed. [8+8]
      i. Calculate the speed of motor if 0.05 ohm is inserted in the rotor circuit.
      ii. What is the maximum external resistance that can be inserted in the rotor and corresponding speed.

5. (a) Discuss the points of similarities between a transformer and an induction machine. Hence, explain why an induction machine is called a generalized transformer.
   (b) Explain why an induction motor, at noload, operates at a very low power factor. [8+8]

6. (a) Explain the functions of the following in a transformer

i. Breather [2]
ii. Conservator [2]
iii. Oil [2]

(b) Draw and explain phasor diagram of transformer on lagging load. [4+6]

7. (a) Explain the procedure to predetermine the efficiency and regulation of a transformer with all necessary equations. (need not explain test procedures if any)

(b) The iron losses in a transformer core at normal flux density were measured at frequencies of 30 and 50Hz and the results being 34W and 55W respectively. Calculate the hysteresis and eddy current losses at 50Hz. [8+8]

8. (a) Explain various losses and derive the condition for minimum efficiency of a transformer .

(b) The efficiency at unity power factor of 6600/384 volts 100 KVA 50 Hz single phase transformer is 98% both at full load and at half full load. The power factor on no load is 0.2 and the full load regulation at a lagging power factor of 0.8 is 4 %. Draw the equivalent circuit referred to L.V. side and insert all the values. [6+10]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR220205 **RR** **Set No. 3**

II B.Tech II Semester Examinations,December 2010
ELECTROMECHANICS - II
Electrical And Electronics Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Explain various losses and derive the condition for minimum efficiency of a transformer .
   (b) The efficiency at unity power factor of 6600/384 volts 100 KVA 50 Hz single phase transformer is 98% both at full load and at half full load. The power factor on no load is 0.2 and the full load regulation at a lagging power factor of 0.8 is 4 %. Draw the equivalent circuit referred to L.V. side and insert all the values. [6+10]

2. (a) What are the conditions required for the parallel operation of two transformers.
   (b) Derive the equations for the currents supplied by each transformer when two transformers are operating in parallel with equal voltage ratios. [6+10]

3. (a) Explain the functions of the following in a transformer
      i. Breather [2]
      ii. Conservator [2]
      iii. Oil [2]
   (b) Draw and explain phasor diagram of transformer on lagging load. [4+6]

4. (a) With the help of rotor equivalent circuit of an induction motor, show that the power transferred magnetically from stator to rotor is given by $\frac{I_2^2 r_2}{s}$ per phase.
   (b) Explain the terms air gap power P_g, internal mechanical power developed Pm and shaft power Psh. How are these terms are related with each other? Hence show that Pg : rotor ohmic loss : P_m = l; s : 1-s. [8+8]

5. A 10KW, 415V, 4-pole, 3-phase star connected induction motor gave the following test results.
   No load test: 415V, 8A, 1200 watt
   Blocked rotor test : 200V, 45A, 7000 watt
   Stator and rotor ohmic losses are equal at stand still. Draw circle diagram and find efficiency and speed at half full load. [8+8]

6. (a) Discuss the points of similarities between a transformer and an induction machine. Hence, explain why an induction machine is called a generalized transformer.
   (b) Explain why an induction motor, at noload, operates at a very low power factor. [8+8]

7. (a) A 3-phase, 4 pole, 50 Hz, squirrel cage Induction motor has rotor leakage impedance of 1 + j2 Ω/ph, stand still voltage of 100V per phase driving a constant torque load at 0.03 slip. What is speed of the motor, if
   i. supply voltage in increased by 25% and frequency is constant.
   ii. supply voltage in increased by 25% and frequency is decreased by 25%

   (b) A 3-phase, 400V, 6-pole, 50HZ, 960 rpm slip ring induction motor has rotor resistance of 0.1 ohm per phase and leakage reactance of 0.5 ohm per phase. The load torque is independent of the speed. [8+8]
   i. Calculate the speed of motor if 0.05 ohm is inserted in the rotor circuit.
   ii. What is the maximum external resistance that can be inserted in the rotor and corresponding speed.

8. (a) Explain the procedure to predetermine the efficiency and regulation of a transformer with all necessary equations. (need not explain test procedures if any)

   (b) The iron losses in a transformer core at normal flux density were measured at frequencies of 30 and 50Hz and the results being 34W and 55W respectively. Calculate the hysteresis and eddy current losses at 50Hz. [8+8]

⋆ ⋆ ⋆ ⋆ ⋆