Code No: T0222 **R07** SET - 1

II B. Tech II Semester Supplementary Examinations April/May – 2013
ELECTRICAL MACHINES - II
(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 the types of Single phase transformers.
   b) How will you minimize the hysteresis and eddy current losses that occur in single phase transformers?

2. a) Derive the condition for maximum efficiency of a single phase transformer.
   b) A 10 kVA, Single phase transformer for 2000/400 V at no load, has R_1=5.5Ω, X_1=12 Ω, R_2=0.2 Ω, X_2=0.45 Ω. Determine the approximate value of the secondary voltage at full load, 0.8 p.f lagging, when the primary applied voltage is 2000 V.

3. a) Explain the principle and operation of an Auto transformer in detail.
   b) A 250 kVA transformer with 0.015 per unit resistance and 0.04 per unit reactance is connected in parallel with a 500 kVA transformer having 0.01 per unit resistance and 0.05 per unit reactance to share a load of 750 kVA at 0.80 power factor lagging. Find how the transformer share the load when the open circuit secondary voltages are 400 V on no load.

4. a) Explain with the help of connection diagram and phasor diagram, how the Scott connections are used to obtain two-phase supply from 3 – phase supply mains.
   b) A 3 – phase transformer has a delta connected primary and is supplied at 11000 V. The terminal voltage (line voltage) of the star connected secondary at 0.8 power factor lagging is 400 V. The effective resistance and reactance drops are 1.5 % and 6% respectively. Determine the approximate transformation ratio.

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Code No: T0222 **R07** SET - 1

5. a) Explain the constructional details of 3 – phase induction motors.
   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

6. a) Derive the expression for torque of a 3 – phase induction motor and from the torque equation deduce the expressions for maximum torque and starting torque for 3 – phase induction motor.
   b) The stator loss of a 3 – phase induction motor is 2 kW. When the power input is 90 kW, what will be the rotor mechanical power developed and the rotor copper loss if the motor is running with a slip of 4%.

7. a) What is circle diagram and what is it's significance? How it can be drawn.
   b) Explain the starting methods of 3 – phase induction motors.

8. a)Write short notes on Induction generator
   b) Explain any one speed control method of 3 – phase induction motor.

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Code No: T0222 **R07** SET - 2

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ELECTRICAL MACHINES - II
(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 the working principle of operation of a single phase transformer under no load and load conditions with phasor diagram.
   b) A transformer with an output voltage of 4200 V is supplied at 230 V. If the secondary has 2000 turns, calculate the number of primary turns.

2. a) Draw and derive the equivalent circuit parameters of a single phase transformer.
   b) A single phase transformer working at unity power factor has an efficiency of 90 % at both half load and at the full load of 500 W. Determine the efficiency at 75 % full load.

3. a) Explain how will you pre determine the efficiency and regulation by conducting OC & SC tests on a single phase transformer with neat circuit diagrams.
   b) A 50 kVA, 2200 V/1100 V single phase 50 Hz transformer has a full-load efficiency of 95% and iron loss of 500 W. The transformer is connected as an Auto-transformer to a 3300 V supply. When it delivers a load of 50 kW at unity power factor at 1100 V, Calculate the currents in the windings. Find also the increase in output as auto-transformer and also calculate the copper losses as two winding transformer.

4. a) What are the possible connections for a 3 – phase transformer bank? Explain.
   b) A 3 – phase, step down transformer takes 15 A when connected to 4400 V mains. The turn ratio per phase is 10. Neglecting losses find the secondary line voltage, line current and output if the transformers windings are connected in delta/star.

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Code No: T0222 **R07** SET - 2

5. a) Explain the principle and operation of a 3 – phase induction motor by rotating magnetic field.
   b) A 3 – phase, 50 Hz, 4 – pole induction motor has a slip of 4%. Calculate
   i) Speed of the motor ii) Frequency of the rotor emf.

6. a) Draw and explain slip – torque characteristics of 3 – phase induction motor.
   b) The power input to the rotor of 440 V, 50 Hz, 6 – pole, 3 – phase induction motor is 80 kW. The rotor emf is observed to make 100 complete alternations per minute. Calculate:
   i) The slip ii) The rotor speed iii) Mechanical power developed
   iv) The rotor copper loss per phase v) The rotor resistance per phase if the rotor current is 65A

7. a) Explain any one method of starting of a 3 – phase induction motor.
   b) A 50 kW, 6 – pole, 50 Hz, 450 V, 3 – phase slip ring induction motor furnished the following test figures.
   No load test: 450 V, 20 A, p. f = 0.15
   Blocked rotor test: 200 V, 150 A, p. f=0.3
   The ratio of stator to rotor copper losses on short circuit was 5:4. Draw the circle diagram and determine from it
      i) The full load current and power factor
      ii) The maximum torque and the maximum power input
      iii) Slip at full load iv) efficiency at full load.

8. a) Explain the principle of operation of Induction generator.
   b) What are the different speed control methods of 3 – phase induction motor? Explain any one method in detail.

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Code No: T0222 **R07** SET - 3

II B. Tech II Semester Supplementary Examinations April/May – 2013
ELECTRICAL MACHINES - II
(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) Derive the emf equation of single phase transformer.
   b) Explain the constructional details of single phase transformers.

2. a) Derive the value of current at maximum efficiency.
   b) At 400 V and 50 Hz the core loss of a transformer was found to be 2400 W. When the transformer is supplied at 200 V and 25 Hz, the core loss is 800 W. Calculate the hysteresis and eddy current loss at 400 V and 50 Hz.

3. a) Explain the parallel operation of single phase transformer in detail.
   b) An open circuit test on a 50 kVA, 2400 V/240 V transformer gives 240 V, 5.41 A and 186 W when the measurements were made on secondary side. The short circuit test results when measured on the primary side are 48 V, 20.8 A and 617 W. Calculate the efficiency and regulation at full load with a power factor of 0.8 lagging.

4. a) Explain the advantages of using tertiary winding.
   b) A 3 – phase, 1000 kVA, 6600 V/1100 V transformer is delta connected on the primary and star connected on the secondary. The primary resistance per phase is 1.8 ohm and secondary resistance per phase is 0.025 ohm. Determine the efficiency on full load at
   i) Unity power factor ii) 0.8 power factor lagging if the iron loss is 15 kW.

5. a) Determine the rotor emf, frequency, current and reactance under running condition of a 3 – phase induction motor..
   b) A 12 – pole, 3 – phase alternator is coupled to an engine running at 500 rpm. It supplies an induction motor which has a full load speed of 1440 rpm. Find the slip and the number of poles of the motor.
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Code No: T0222 **R07** SET - 3

6. a) Write short notes on double cage and deep bar rotors.
   b) The power input to a 3 – phase induction motor is 60 kW. The stator losses is 1 kW. Find the total mechanical power developed and the rotor copper loss per phase if the motor is running with a slip of 3%.

7. a) Explain the significance and the procedure of no load test on a 3 – phase induction motor
   b) Draw the circle diagram for a 3 – phase, 6 – pole, 50 Hz, 400 V, star connected Induction motor from the following data (line value). No load test: 400 V, 10 A, 1400 W, Blocked rotor test: 200 V, 55 A, 7000 W.
   The stator loss at stand still is 60 % of the total copper losses and full load current is 30A. from the circle diagram determine: i) Power factor, Slip, output, efficiency, Speed. ii) Starting torque iii) Maximum power output and inputs. iv) Maximum torque and slip.

8. a) Explain speed control methods of 3 – phase induction motors in detail with change of frequency and poles.
   b) Write short notes on speed control of induction motor with injection of an emf into rotor circuit.

Code No: T0222 **R07** SET - 4

II B. Tech II Semester Supplementary Examinations April/May – 2013
ELECTRICAL MACHINES - II
(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 the working principle of operation of single phase transformer under lagging load condition with phasor diagram.
   b) A 3300/250 V, 50 Hz single phase transformer is built on a core having an effective cross-sectional area of 125 cm^2 and 70 turns on the low-voltage winding. Calculate: i) The value of maximum flux density ii) The number of turns on the high voltage winding.

2. a) Define regulation of transformers and also deduce the condition for zero voltage regulation.
   b) In a transformer, the core loss is 100 W at 40 Hz and 72 W at 30 Hz. Find the hysteresis and eddy current losses at 50 Hz.

3. a) Explain the significance and procedure to conduct Sumpner's test with neat circuit diagram.
   b) The readings obtained from the open circuit and short circuit tests on a single phase transformer of 100 kVA, 1100 V/220 V rating are given. Calculate the various parameters and draw the equivalent circuit of the transformer.
   O. C. test: supply is given to the low voltage side.
   V_2=220 V, I_{02}=20 A, W_0=500 W
   S. C. test: short circuit test is conducted on HV side
   V_{SC}=90 V, I_1=90.9 A, W_{SC}=1000 W

4. a) Explain the working principle of three phase transformer and also explain the possible connections for a 3 – phase transformer bank.
   b) A 3 – phase, step down transformer takes 15 A when connected to 4400 V mains. The turn ratio per phase is 10. Neglecting losses find the secondary line voltage, line current and output if the transformers windings are connected in star/delta.

5. a) Explain how the rotating magnetic field is produced in a 3 – phase induction motor and also explain it's principle of operation.
   b) The frequency of the emf in the stator of a 4 – pole induction motor is 50 Hz, and that in the rotor is 1.5 Hz. What is the slip, and at what speed is the motor running.
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Code No: T0222 **R07** SET - 4

6. a) What is crawling and what is cogging? Explain in detail.
   b) A 6 – pole, 50 Hz, 3 – phase induction motor running on full load develops a useful torque of 150 Nm at a rotor frequency of 1.5 Hz. Calculate the shaft power output if the mechanical torque lost by friction be 10 Nm, determine: i) rotor copper loss ii) the input to the motor and iii) the efficiency.

7. What is the purpose of conducting no load and blocked rotor tests on a 3 – phase induction motors. Explain the procedure with neat circuit diagram and also explain the relevant calculations.

8. a) Explain the speed control of 3 – phase induction motors by changing frequency, by changing number of poles and cascade connection.
   b) Write short notes on induction generator.