Code No: R22024   **R10**   SET - 1

II B. Tech II Semester Supplementary Examinations Dec – 2012
ELECTRICAL MACHINES -II
(Electrical and Electronics Engineering)

Time: 3 hours   Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Describe in detail, the constructional features of 1-phase transformers.
    b) A 3300/250V, 50Hz, 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 the maximum flux density in the core ii) the number of turns on the high voltage winding.

2. a) Derive the condition for maximum efficiency of 1-phase transformer.
    b) A single-phase, 100KVA, 2000/200V, 50Hz transformer has an reactance drop of 10% and resistance drop of 5% calculate.
        i) Regulation at full load, 0.8 power factor lagging
        ii) The value of the power factor at which regulation is zero.

3. a) With the help of a neat circuit diagram, explain how sumpner's test is conducted.
    b) Explain the principle of auto transformer, its advantages, disadvantages, and applications.

4. a) What are the advantages and disadvantages of STAR-STAR choice of 3-phase transformer connection?
    b) Two transformers are connected in open delta and supply a balanced 3-phase load of 240 KW at 400 volts and a power factor of 0.866 lagging. Determine. i) The Secondary line current ii) The KVA load on each trans-former iii) The power delivered by the Individual transformers. If a third transformer having the same rating as each of the other two is added to form a Delta Bank, what total load can be supplied?

5. a) Discuss the principle of operation of 3-phase Induction Motor.
    b) A 3- phase, 6-pole, 50Hz 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 v) frequency of rotor current at full load.

6. a) Derive the condition for maximum starting torque of 3-phase Induction motor.
    b) Explain, in detail, the 'crawling' and 'cogging' phenomena.

7. a) With the help of a neat circuit diagram, explain the use of Star-Delta starter for 3-phase Induction motor.
    b) Calculate the percentage reduction in torque when the supply voltage to a cage motor is 75 percent instead of 100percent. When it is started through starter?

8. a) What are the demerits of speed control of 3-phase induction motor by cascading connection? Explain in detail the concept with neat diagrams.
    b) Explain speed control of induction motor by e.m.f injection into the rotor circuit?

Code No: R22024 $\boxed{\textbf{R10}}$ $\boxed{\text{SET - 2}}$

II B. Tech II Semester, Supplementary Examinations, Dec – 2012
ELECTRICAL MACHINES -II
(Electronics and Electronics Engineering)

Time: 3 hours   Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Derive the e.m.f. equation of transformer.
   b) A transformer with 800 primary turns and 200 secondary turns and it is supplied from a 100 V a.c. supply. Calculate the secondary voltage and the volts per turn.

2. a) Draw the equivalent circuit diagram of a 1-phase transformer on load. Indicate all quantities on the diagram and explain the nomenclature used.
   b) A Single-phase transformer working at unity power factor has an efficiency of 90% at both half load and at full load of 500W. Determine the efficiency at 75% full load and the maximum efficiency.

3. a) With the help of a neat circuit diagram explain how short circuit test is conducted on a single-phase transformer. How the regulation of transformer is calculated from the test results.
   b) Compare two-winding transformer and auto transformer with respect to
      i) VA rating ii) core size iii) cost iv) Losses and efficiency

4. a) Write a detailed note on "OFF-LOAD" and "ON-LOAD" tap changers of tap clamping transformer?
   b) What is the principle of SCOTT connection? Explain clearly.

5. a) With the help of necessary derivation, show that a rotating magnetic field is produced in a 3-phase induction motor
   b) The frequency of e.m.f. in the stator of a 4-pole induction motor is 50Hz, and that in the rotor is 1.5 Hz. Compute i) slip ii) rotor speed.

6. a) Draw the 'Torque-slip' characteristic of 3-ph induction motor and explain its salient features.
   b) A 6-pole, 3-phase, 50Hz induction motor runs on full load with a slip of 4% Given the rotor standstill impedance per phase as $(0.01+0.05)\Omega$, calculate the available maximum torque in terms of full-load torque. Also determine the speed at which the maximum torque occurs.

7. a) Explain 'Auto Transformer starting' of 3-phase induction motor, with the help of necessary circuit diagram.
   b)Find the ratio of starting to full load current for a 10KW, 400V, three-phase induction motor with star-delta starter, given that the full load efficiency is 0.86, the full-load power factor is 0.8 lag. And the short circuit current is 30A at 100V.

8. a) Write in detail about the methods of speed control by changing the number of pole pairs in the stator?
   b) Discuss about induction generator in detail?

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Code No: R22024 $\quad$ **R10** $\quad$ SET - 3

II B. Tech II Semester, Supplementary Examinations, Dec – 2012
ELECTRICAL MACHINES -II
(Electronics and Electronics Engineering)

Time: 3 hours $\hfill$ Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Clearly explain the principle of operation of Transformer.
    b) A 125 KVA transformer having primary voltage of 2000 V at 50 Hz has 182 primary and 40 Secondary turns. Neglecting losses, calculate i) The full-load primary and secondary currents ii) the no-load secondary induced e.m.f. and iii) the maximum flux in the core.

2. a) Explain the effect of variation of i) frequency, and ii) supply voltage on iron losses in a transformer.
    b) A 2300/230V,500 KVA, 50Hz distribution Transformer has a core losses of 1600W at rated voltage and copper losses of 7.5 KW at full load. During the day it is loaded as follows:
    No Load for 2 hours
    20% Load for 4 hours at 0.7 lag pf
    50% Load for 4 hours at 0.8 lag pf
    80% Load for 5 hours at 0.9 lag pf
    100% Load for 7 hours at upf
    125% Load for 2 hours at 0.85 lag pf
    Determine the all –day-efficiency of the Transformer

3. a) With the help of a neat circuit diagram, explain how separation of core losses is done experimentally.
    b) Deduce the equivalent circuit of auto transformer?

4. a) Write a detailed note on 'transients in Switching.
    b) Two single phase Scott-connected transformers supply a 3-phase 4-wire 50Hz distribution system with 400V between lines. The HV winding are connected to a 2-phase 6000V (per phase) system. The core area is 250 cm^2 while the maximum allowable flux density is 1.2T. Determine the number of turns on each winding and the point to be tapped for the neutral wire on the 3-phase side.

5. a) Describe the constructional details of squirrel cage induction motor? Explain the constructional difference of squirrel cage and slip ring induction motors.
    b) The power input to a 3-phase induction motor is 60KW. The stator losses total 1 KW. Find the total mechanical power developed and the rotor copper loss per phase if the motor runs at 3% slip.

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R10

SET - 3

6.   a) Draw the equivalent circuit of a 3-phase induction motor?
     b) Discuss the concept and constructional features of i) double cage ii) deep bar motors.

7.   a) Draw the circle diagram for a 5 hp, 200v, 50Hz, 4-pole, 3-phase, star-connected induction motor from the following data:
     200V,5A, 350 watts ii)100V,26A, 1700 watts.
     Rotor copper loss at stand still=half of the total copper loss.
     Estimate there from the full load current, power factor, speed, and torque.

8.   a) Explain frequency control method of speed variation of induction motor?
     b) The rotor of a 6-pole, 50 Hz, slip-ring induction motor has a resistance of 0.25Ω per phase and runs at 975 rpm at full load. Calculate the external resistance per phase which must be added to reduce the speed to 950 rpm, the torque being the same as before.

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R10

SET - 4

II B. Tech II Semester Supplementary Examinations Dec – 2012
ELECTRICAL MACHINES -II
(Electronics and Electronics Engineering)

Time: 3 hours
Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Draw the phasor diagram of 1-phase Transformer on load for i) inductive load ii) capacitive load. Indicate all quantities and explain.

    b) A single phase transformer with a ratio of 440/110V takes a no-load current of 5A at 0.2 power factor lagging. If the secondary supplies a current of 120A at a pf of 0.8 lagging. Estimate the current taken by the primary.

2. a) What are the various losses that occur in transformers?

    b) A 1000V, 50Hz supply to a transformer results in core losses as 650 hysteresis loss and 400W eddy current loss. If both the applied voltage and frequency are doubled, find the new core losses.

3. a) What are the conditions to be satisfied for satisfactory parallel operation of 1-phase transformers? Explain.

    b) Two 1-phase transformers with equal turns have impedances of (0.5+j3) ohm and (0.6+j10) ohm with respect to the secondary. If they are operated in parallel, determine how they share a total load of 100kW at p.f 0.8 lagging.

4. a) Write a note on third harmonics in phase voltages if three phase transformer

    b) A 3-phase step-down transformer is connected to 6.6 kV mains and takes 10A. Calculate the secondary line voltage, line current and output for the following connections: (i) Delta/Star and (ii) Star/Delta. The ratio of turns per phase is 12. Neglect losses.

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$\boxed{\textbf{R10}}$

$\boxed{\text{SET - 4}}$

5. a) Compare and contrast Squirrel-cage and slip-ring motors with respect to construction, operation, and performance.

b) The power input to the rotor of a 440V, 50Hz, 3-phase, 6-pole induction motor is 60KW. It is observed that the rotor emf makes 90 complete cycles per minute. Calculate i) slip ii) the rotor copper loss and iii) mechanical power developed.

6. a) With the help of necessary derivation, show that i) maximum torque is independent of rotor circuit resistance ii) maximum torque varies directly as the square of supply voltage.

b) A 746 kW, 3-phase, 50Hz, 16-pole induction motor has a rotor impedance of (0.02+j0.15) Ω at stand still. Full –load torque is obtained at 360 rpm. Calculate i) The ratio of maximum full-load torque ii) The speed for maximum torque iii) The rotor resistance to be added to get maximum starting torque.

7. a) With the help of neat circuit diagram, explain how rotor blocked test is conducted on 3-phase induction motor.

b) Describe the procedural steps for drawing circle diagram form the observations of NO-Load test and rotor-blocked test. How the circle diagram is useful?

8. a) Explain the methods of speed control of 3-phase induction motor by i) stator voltage control ii) Stator frequency control.

b) Discuss the principle of operation of induction generator.