Bachelor of Electrical Engineering (Evening), 2017

(3rd Year, 1st Semester, Supplementary)

ELECTRICAL MACHINES - II

Time: Three Hours   **Full Marks: 100**

(50 marks for each part)
Use a separate Answer-Script for each Part

PART-I.

Answer *any three* questions from this part.
Two marks are reserved for neat and well organised answer.

1. a) Show that a balanced three phase supply on balanced three phase winding can produce a   12
    rotating magnetic field with constant amplitude. Find out the speed of rotation of the
    magnetic field. How can you change the direction of rotation of a three phase induction
    motor?

    b) Explain the principle of operation of a three phase induction motor. What is slip?   4

2. a) Derive an expression for torque produced in a three phase induction motor. Establish the   10
    condition for maximum developed torque and discuss how it is affected with the change
    in rotor resistance.

    b) The maximum torque of a 3-phase induction motor occurs at a slip of 12%. The motor   6
    has an equivalent secondary resistance of 0.08 ohm/phase. Calculate the equivalent load
    resistance R_L, the equivalent load voltage V_L and the current at this slip, if the gross
    power output is 9,000 watts.

3. a) Develop equivalent circuit of a polyphase induction motor stating the assumption(s)   8
    taken and also develop its approximate equivalent circuit for the ease of calculation.

b) Describe no-load and blocked rotor tests of an induction motor and calculate the equivalent circuit parameters from these test results.   8

4. a) Why starters are necessary for starting an induction motor? What are the various types of starters used for starting of squirrel cage induction motor? Describe with circuit diagram the working of any one type of starter for starting squirrel cage induction motor and hence derive an expression for starting torque in terms of full-load torque.   10

b) Describe briefly the phenomenon of cogging and crawling? What measures can eliminate these effects?   6

5. a) What is the purpose of using deep-bar cage rotors? Explain the construction and working of a deep-bar motor.   8

b) Derive the relationship between the torques developed by outer and inner cages of a double cage induction motor. Also draw the torque-slip characteristic of a double cage induction motor.   8

Bachelor of Electrical Engineering(Evening) , 3ʳᵈ Year 1ˢᵗ Semester
Supplementary Examination, 2017

SUBJECT: ELECTRICAL MACHINES-II

Time: Three Hours

Full Marks: 100 (50 each part)

Use a separate Answer-Script for each part
PART - II

Answer any three questions. Question no. 3 carries 18 marks.

1. (i)   From the harmonics point of view core type of three phase transformer   5+5+6=16
is better than the shell type three phase transformers.

   (ii)   What type of problem may arise for Y-y connected three phase
transformer?

   (iii)   How Delta winding is used to overcome the problems of harmonics in a
three phase transformers?

2. (i)   What is the difference in magnetic circuit of three phase transformer   4+6+6=16
bank and core type three phase transformer unit?

   (ii)   Draw the connection diagram and phasor diagram of the following
connections.

   a) Yz11 ,   b) Yd11

   (iii)   Show how Yd1 and Dy11 transformer can be connected in parallel
successfully.

3. (i)   If one winding on either side becomes faulty in a Delta/delta connected   5+4+9=18
transformer, how it can be operated in open delta to give three phase
output to give a three phase output equal to 0.577 of the total rated
output.

   (ii)   How single phase supply can be obtained from a three phase supply
using a **Scott**-connected transformer?

PART - II

(iii) In Scott-connected transformers, teaser transformer supplies unity power factor load of 550 kW at 200 V and main transformer supplies 0.8 power factor lagging load of 400 kW at 200 V, from a three phase input line voltage of 6600V. Determine the input line currents. Neglect magnetizing currents and the leakage impedance drops. Draw voltage and current phasors computed.

4. i) What are the advantages and disadvantages of Reactor type Tap-changers?   **4+6+6=16**

ii) Discuss about the difficulties to incorporate tapings for tap-changing in the transformer windings.

iii) Describe a centre-tap reactor on-load tap-changer with proper sequence of operations of changing the terminal voltage.

5. Write Short notes on   **8 x 2 =16**

(i) Full wave and chopped wave impulse voltage tests on a transformer for detection of faults.

(ii) Development of voltage stress along the winding of a three phase transformer for impulse and RMS voltages and the measure to be taken to withstand it.