

Roll No

EE/EX - 404**B.E. IV Semester Examination, June 2014****Electrical Machine - I***Time : Three Hours***Maximum Marks : 70**

- Note:** i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.
 ii) All parts of each question are to be attempted at one place.
 iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.
 iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) Derive the E.M.F equation of single phase transformer? 2
- b) Explain the basic principle of tertiary winding? 2
- c) Derive the expression of saving of copper in an auto transformer as compared to an equivalent two winding transformer? 3
- d) An auto transformer supplied a load of 5kW at 125V at unity power factor. If the primary voltage is 250V, determine (a) Transformation ratio (b) Secondary Current (c) Primary Current (d) Number of turns on secondary if the total number of turns is 250 (e) Power transformed and (f) Power conducted? 7

OR

The high and low voltage windings of a 6600/250V, 50Hz, single phase transformer have resistances of 0.20Ω and $3.1 \times 10^{-4}\Omega$ and reactances of 1.0Ω and $1.69 \times 10^{-3}\Omega$ respectively. Find the input current and power when the high voltage winding is connected to a 200V, 50Hz supply and the low voltage winding is short circuited? 7

Unit - II

2. a) What do you understand by Tap changing transformers? 2
- b) Write the necessary conditions for two transformer operated in parallel? 2
- c) Draw the physical connection and phasor diagram of the following transformer connection (a) Yd0 (b) Dy0 (c) Yd6. 3
- d) Two 110V single phase furnace take loads of 500kW and 800kW respectively at a power factor of 0.71 lagging and are supplied from 6600V, 3-phase main through Scott connection transformer combination. Calculate the current in the 3-phase line? 7

OR

Describe in brief Scott connection of two single phase transformer for conversion of a balanced 3-phase to a balanced 2-phase supply. Draw circuit diagram and phasor diagram? 7

Unit - III

3. a) Write four difference between transformer machine and 3-phase Induction motor? 2

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- b) Discuss the advantages of slip ring Induction motor over squirrel cage Induction motor? 2
- c) How a rotating magnetic field is produced when a 3-phase supply is given to Induction motor? Derive suitable derivation? 3
- d) Give the procedure of conducting no-load and blocked rotor test on 3-phase induction motor. How are the parameters of the equivalent circuit determined from the test results? Draw the equivalent circuit of the 3-phase induction motor? 7

OR

The input power to a 6 pole, 3-phase, 50Hz induction motor is 42W. The speed is 970 r.p.m. The stator losses are 1.2kW and the friction and windage losses are 1.8kW find

- i) The rotor copper loss
- ii) The efficiency of the motor 7

Unit - IV

- 4. a) Write different methods of speed control in brief? 2
- b) What do you understand by time and space harmonics in 3-phase induction motor? 2
- c) Write differences between double cage and deep bar rotor of 3-phase induction motor? 3
- d) Explain the term air gap power P_g , internal mechanical power developed P_m and derive the relation $P_g : P_{\text{rotor cu. loss}} : P_m = 1:S:1-S$, where S is the slip? 7

OR

A 3 phase, 500V, 50Hz induction motor with 6 poles gives an output of the 20kW at 950 rpm with a pf of 0.8. The mechanical losses are equal to 1kW. Calculate for this load (i) Slip (ii) Rotor copper loss (iii) Input if the stator losses are 1500W (iv) Line current. 7

Unit - V

- 5. a) Why single phase Induction motor is not self starting? 2
- b) Draw the connection diagram of a capacitor-start induction motor showing starting and main winding? 2
- c) Derive the equivalent circuit of a single phase induction motor with the help of double revolving field theory? 3
- d) Prove that a single phase motor winding when excited by a single phase supply produces two equal and opposite revolving fields? 7

OR

Indicate the slip – torque characteristics of different types of single phase induction motors in one diagram and compare. State reasons for their deviations? 7
