Roll No .....

EE - 404

B.E. IV Semester Examination, December 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 questions 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) Develop the phasor diagram of a single phase transformer under lagging power factor load.

   b) In short circuit test, the core loss is negligible in comparison with full load ohmic losses. Explain.

   c) Explain the method by which the separation of the core losses of a transformer is achieved.

   d) A 20 KVA, 2300/230 V, two winding transformer is to be used as an auto transformer, with constant source voltage of 2300 V. At full load of unity power factor, calculate the power output, power transformed and power conducted. If the efficiency of two winding transformer at 0.6 p.f. is 96% find the autotransformer efficiency at the same power factor.

   OR

   A 10 KVA, 2500/250V, single phase transformer gave the following test results:
   O.C. test: 250V, 0.9 Amp, 60 watts
   S.C. test: 70 V, 3.5 Amp, 50 watts

   i) Calculate the efficiency at ¼ and 1¼ of full load at 0.8 power factor.

   ii) Calculate the load (KVA output) at which maximum efficiency occurs.

   iii) Compute the voltage regulation and voltage of secondary terminal under rated low at power factor of 0.6 lagging.

Unit - II

2. a) Explain the clock method of angle designation for representing three phase transformer.

   b) What is the difference between a three phase transformer bank and a three phase transformer unit.

   c) State the conditions essential for the successful parallel operation of the three phase power transformers.

   d) It is desired to transform 2400 V, 5000 kVA three phase power to two-phase power at 600 volt by scott-connected transformers.

   Determine the voltage and current ratings of both primary and secondary of each transformer. Neglect the effects of no-load currents of transformer.

   OR

   Write short notes on the following

   i) Load sharing of three phase transformer.

   ii) Conservator and breather

Unit - III

3. a) Why three phase induction motor can not run on synchronous speed. Justify the statement.
   b) It is possible to add external resistance in the slip ring and squirrel cage induction motor to increase the torque, explain.
   c) Draw and explain the complete torque slip characteristics of three phase induction motor in brief.
   d) A 10 KW, 400V, 4 pole delta connected squirrel cage induction motor gave the following test results.

   No load test : 400 V, 8.5 Amp, 260 watts

   Blocked rotor test: 95 V, 38 Amp, 1500 watts

   The d.c. resistance of stator winding per phase measured immediately after the blocked rotor test is 0.6Ω.

   Calculate the rotational losses and equivalent circuit parameters.

   OR

   Describe the construction of circle diagram to deduce the various performance of the induction motor. What are the various tests to be conducted to draw the above explain in brief.

Unit - IV

4. a) Why you need a starter to start a three phase induction motor.
   b) Give the applications of slipring and squirrel cage induction motor.
   c) What are factors which govern the speed control of three phase induction motor. Explain in brief.
   d) A three phase squirrel cage induction motor has maximum torque equal to Twice the full load torque. Determine the ratio of motor starting torque to its full load torque, if it is started by
      i) start-delta starter
      ii) Auto transformer starter with 70% tapping.

   The per phase rotor resistance and per phase standstill reactance reformed to stator are 0.2Ω and 2Ω respectively. Neglect stator impedance.

   OR

   Describe in detail the impact of unbalanced. Supply and effect of harmonics on the behaviour of three phase induction motor.

Unit - V

5. a) Why a single phase induction motor has no inherent starting torque.
   b) Give a critical comparison of three phase to single phase induction motor in brief.
   c) Classify single phase induction motors in accordance with the methods of starting.
   d) The following data of a 230 V, 50 Hz capacitor start single phase induction motor at stand still.

   Main winding excited along: 100 V, 2 Amp, 45 watts.

   Auxiliary winding excited along: 80 V, 1 Amp, 55 watts.

   Determine the value of capacitance for obtaining the maximum starting torque.

   OR

   Explain the following in brief
   i) Single phase A.C. series motor
   ii) Servo motors

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