Sixth Semester B.E. Degree Examination, Dec. 07 / Jan. 08
Transformer and Induction Machine

Time: 3 hrs.   Max. Marks:100

Note : *Answer any FIVE full questions.*

1 a. Derive an EMF equation for a single phase transformer. Draw and explain vector diagram of transformer loaded with resistive, inductive and capacitive loads separately. **(10 Marks)**
   b. Derive an equation for the output current corresponding to maximum efficiency of the transformer. **(04 Marks)**
   c. A 50 KVA 4400/200V transformer has $R_1 = 3.45\Omega$, $R_2 = 0.009\Omega$, $X_1 = 5.2\Omega$, $X_2 = 0.015\Omega$ calculate the :
   - i) Equivalent impedance referred to Primary.
   - ii) Equivalent impedance referred to Secondary.
   - iii) Total copper loss. **(06 Marks)**

2 a. Explain in details OC and SC test (with circuit diagram) for determination of efficiency and regulation of single phase transformer. **(10 Marks)**
   b. The following readings are obtained for a 6 KVA 240/400V 50Hz single phase transformer
   O.C. Test : Primary Voltage - 240V,
                   Primary Current – 0. 8A,
                   Power consumed - 80W.
   S.C. Test on HV side
                   Voltage - 20V,   Current - 15A,   Power drawn – 80W.
   Find the full load efficiency at 0.8 power factor and unity power factor and also calculate the regulation at 0.8 pf lagging and leading loads. Give your observation on the results. **(10 Marks)**

3 a. What are different types of transformers? Explain their applications. **(10 Marks)**
   b. Prove that an autotransformer will result in saving of copper in place of 2 winding transformer. **(06 Marks)**
   c. Discuss the uses and disadvantages of autotransformer. **(04 Marks)**

4 a. Explain with diagram the method of conversion of 3 phase supply to 2 phase. Show that load is balanced on both sides. **(10 Marks)**
   b. What is All day efficiency?
   Find the All day efficiency of distribution transformer having maximum efficiency of 98% at 15 KVA at u pf of and loaded as follows:
               12Hours – 2 kW at 0.5 pf lag.
               6 Hours – 12 kW at 0.8 pf lag.
               6 Hours – No load. **(10 Marks)**

5 a. What are different types of induction Motors? Explain their uses. **(10 Marks)**
   b. A 400V, 3phase 50 Hz, star connected induction motor has a stator impedance of $(0.06+j0.2)\Omega$ and an equivalent rotor impedance of $(0.06+j0.022)\Omega$. Find the maximum gross power and the slip at which it occurs (neglect exciting current). **(06 Marks)**
   c. Why starter is required for starting an induction motor. **(04 Marks)**

6 a. Explain the steps in detail for construction of circle diagram of a 3 phase induction motor from the data obtained from OC and SC test. **(10 Marks)**

   b. Draw the circle diagram from no-load and short circuit test of a three phase 14.92 kW, 400V, 6 pole induction motor from the following test results with line values.
   No-load – 400V, 10A, 0.2 pf.
   S.C – 100V, 25A, 0.4 pf.
   Rotor copper loss at stand still is half of total copper loss. From the diagram, find
   i) Line current, slip, efficiency and power factor at full load. ii) The maximum Torque. **(10 Marks)**

7 a. Explain the principle of operation of single phase induction motor using double revolving field theory. **(10 Marks)**

   b. Explain different types of starting methods for squirrel cage and phase wound induction motor. **(10 Marks)**

8   Write short notes on any four :
   a. Induction Generator.
   b. Welding Transformer.
   c. Dot Convention.
   d. Methods of Cooling in Transformer.
   e. Losses in Induction Motor. **(20 Marks)**

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