NEW SCHEME

Reg. No. ☐☐☐☐☐☐☐☐☐☐

Sixth Semester B.E. Degree Examination, January/February 2006

Electrical & Electronics Engineering

Transformers and Induction Machine

Time: 3 hrs.)   (Max.Marks : 100

Note: *Answer any FIVE full questions.*

1. (a) What are instrument transformers? Explain.   (5 Marks)

   (b) State different methods of cooling of transformers and explain any two.   (5 Marks)

   (c) When the load current of a transformer increases, how does the input current increase to meet the new conditions. Write the vector diagram.   (10 Marks)

2. (a) What is the effect of

   i)   unequal voltage ratio

   ii)   unequal p.u. impedance

   iii) unequal X/R ratio

   on the parallel operation of two transformers.   (10 Marks)

   (b) A 200/400V, single phase transformer has core loss of 100W. It has a resistance of 0.45Ω and leakage reactance of 1.2Ω both referred to H.V. side. Find the power factor at which the regulation is zero. Full load primary current is 20 A.   (10 Marks)

3. (a) An autotransformer has a transformation ratio a. Derive the equation giving its rating as a fraction of the rating of a two winding transformer.   (10 Marks)

   (b) In a Sumpner's test on two identical single phase transformers rated 500 kVA, 11/0.4kV 50 Hz, the wattmeter reading on H.V. side is 6000 W and on L.V side is 15000 W. Find the efficiency of each transformer on half full load of 0.8 p.f. What will be its maximum efficiency?   (10 Marks)

4. (a) Derive the equation for torque developed by the 3-phase induction motor. Draw a typical torque-slip characteristics curve.   (10 Marks)

   (b) A 6-pole, 50 Hz, 3ϕ, induction motor has rotor resistance of 0.2Ω/phase. Maximum torque is 200 N-m at 850 RPM. Find

   i)   torque at 4% slip

   ii)   additional rotor resistance to get two-thirds of maximum torque at starting. Neglect stator impedance.   (10 Marks)

5. (a) Explain the phenomenon of cogging and crawling in a 3 phase induction motor.
                                                                                         (8 Marks)

   (b) A 400V, 1450 RPM, 50 Hz, wound rotor induction motor has the following circuit modal parameters.

   $R_1 = 0.3\Omega$, $R_2' = 0.25\Omega$ $X_1 = X_2' = 0.6\Omega$, $X_m = 35\Omega$. Rotational loss = 1500W.

   i)   Calculate the starting torque and current when the motor is started direct on full voltage.

   ii)   Find the slip for maximum torque and the value of maximum torque.(12 Marks)

6. (a) Discuss the working of (i) deep bar and double cage induction motor. (10 Marks)

(b) A 2 pole 50 Hz single phase induction motor has an effective rotor resistance and leakage reactance of 0.5Ω each. If it is running at 2600 RPM. Find

   i) Frequencies of rotor current components

   ii) Relative magnitudes of forward and backward fluxes.

   Neglect magnetising current and stator impedance. (10 Marks)

7. (a) What is induction generator. Discuss the principle of operation. (6 Marks)

(b) Explain double field revolving theory as applied to single phase induction motor. (6 Marks)

(c) The equivalent circuit shown refers to a 200/400V, 1ϕ, 50 Hz, 4 kVA transformer, the values given being reduced to the low voltage side. For a high voltage current of 10A, at a lagging power factor of 0.8. Calculate

   i) the low voltage input current

   ii) the efficiency. (8 Marks)
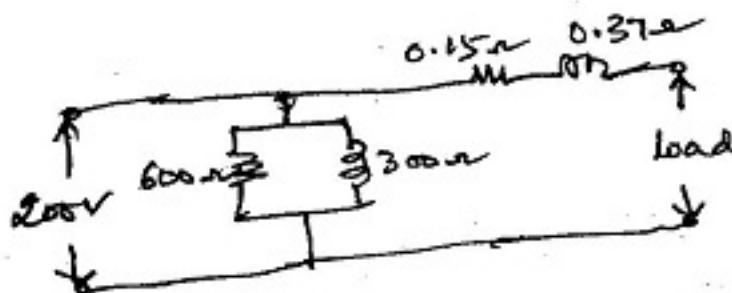
8. (a) Discuss the procedure for no-load test and blocked rotor test on a 3 phase induction motor. How are the parameters of equivalent circuit determined from test results? (10 Marks)

(b) Write short notes on :

   i) Electronic starters for 3 phase induction motors (5 Marks)

   ii) Circle diagram. (5 Marks)

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