Total No. of Questions :5] *[Total No. of Printed Pages :4*

Roll No .....

EE/EX - 404

B.E. IV Semester

Examination, December 2012

Electrical Machine - I

Time : Three Hours

Maximum Marks : 70/100

Note: 1) Attempt any *five* questions.
2) All questions carry equal marks.
2) Missing data if any may be suitably assumed.

Unit - I

1. a) Explain the working principle of single phase transformer and then derive emf equation for the same.

   b) The primary and secondary voltages of an autotransformer are 500 volt and 400 volt respectively. Show with the help of a diagram, the current distribution in the winding when the secondary current is 100 Amp and calculate the economy of copper.

Or

(a) Describe open circuit and short circuit test on single-phase transformer with lab circuit diagram.

(b) A 4KVA, 200/400V, single phase transformer has equivalent resistance and reactance referred to l.v.side equal to 0.5Ω and 1.5Ω respectively. Find the terminal voltage on the high voltage side when it supplies $^{3}/_{4}^{th}$ full-load at power factor of 0.8, the supply voltage being 200 volt.

Find, the output of the transformer and its efficiency if the core losses are 100 watts.

Unit - II

2. a) Explain pulse and high frequency transformer with its specific field of applications in brief.

b) Two, single phase transformer, one of 100 KVA and the other of 50K VA are connected in parallel to the same bus-bars on the primary side, their no-load secondary voltage being 1000volt and 950volt respectively. Their resistances are 2Ω and 2.5Ω percent respectively and their reactances 8 and 6 percent respectively.

Calculate no load circulating current in the secondaries.

Or

a) Discuss the three phase transformer groups and connections with circuit diagrams and symbols in brief.

b) Two single phase furnaces working at 100 volt are connected to 3300 volt, three phase mains through scott connected transformers. Calculate the current in each line of the three-phase mains when power taken by each furnace is 400 KW at a power factor of 0.8 lagging. Neglect losses in the transformer.

Unit - III

3. a) Draw and explain the complete torque-speed characteristic of three phase induction motor.

   b) 220V, 3ϕ, 4-pole, 50Hz, Y-connected induction motor is rated 3.73 KW. The equivalent circuit parameters are:

   $R_1 = 0.45\Omega$, $X_1 = 0.8\Omega$, $R_2^1 = 0.4\Omega$, $X_2^1 = 0.8\Omega$, $B_0 = -{}^1/_{30}$ mho.

   The stator core loss is 50W and rotational loss is 150 watts. For a slip of 0.04, find :

   i) input current ii) power factor

   iii) air gap power iv) efficiency

   v) mechanical power vi) electromagnetic torque

   viii) output power

Or

Draw and explain the instruction of circle diagram to deduce performance characteristics of the three phase induction motor in detail.

Unit - IV

4. Describe various starting methods of three-phase induction motor with circuit diagram and derive the expression for starting torque to full load torque in each type.

Or

a) Explain double cage and deep bar induction motor used for high starting torque applications and how it is differ from the three phase slip ring induction motor.

b) The rotor of a 6-pole, 50Hz, slip rms induction motor has a resistance of 0.2Ω per phase and runs at 980 rpm on full load. Calculate the approximate resistance per phase of a rotor sehostate such that speed is reduced to 800 rpm for full load torque.

Unit - V

5. a) Explain double revolving field theory of single-phase induction motor in brief.

b) The following data of a 230 volt, 50Hz capacitor-start single phase induction motor at standstill. Main winding excited alone: 100 volt, 2A, 40watt. Auxiliary winding excited alone: 80volt, 1A, 50watts. Determine the value of capacitance for obtaining the maximum starting torque.

Or

a) Describe construction, working principle, their types & obtain the tractive force expression of linear induction motor.

b) Explain the measurement of equivalent circuit parametors of single phase induction motor with lab circuit diagrams (tests).

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