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NEW SCHEME

Sixth Semester B.E. Degree Examination, July 2007
Electrical and Electronics Engineering
Transformers and Induction Machine

Time: 3 hrs.] [Max. Marks:100

Note : *Answer any FIVE full questions.*

1 a. Explain with the help of phaser diagrams the operatrions of single phase transformer on load at i) Unity power factor ii) lagging power factor iii) Leading power factor. **(06 Marks)**

b. State and prove the condition under which a transformer operates at maximum efficiency. **(04 Marks)**

c. A 10 kVA, 500/250V, 50 Hz single phase transformer had its maximum efficiency of 94%, when delivering 90% of its rated output at unity power factor. Estimate full load copper losses and iron losses of transformer, also find efficiency when delivering its full load output at 0.8 pf lag. **(10 Marks)**

2 a. Explain the tests to be carried on a single phase transformer and develop the equivalent circuit and show how the parameters of the primary and secondary winding may be combined to give a simplified equivalent circuit referred to primary side. **(10 Marks)**

b. Obtain the equivalent circuit of a 200/400 V, 50Hz 1 phase transformer from the test data.

O.C. Test :	200V, 0.7A, 70W	LV side readings
S.C. Test :	15v, 10A, 85W	HV side readings

Calculate the secondary voltage when delivering 5 kW load at 0.8 pf lagging, the primary voltage being 200V. **(10 Marks)**

3 a. Define "All day efficiency" of a transformer. Explain its importance in distribution transformers. How does it differ from commercial or ordinary efficiency? **(05 Marks)**

b. Write a brief note on different methods of cooling of transformers. **(05 Marks)**

c. There are two 100 kW transformers. Each has a maximum efficiency of 98% but in one of the transformer maximum efficiency occurs at full load while, in the other it occurs at half load. Each transformer is on full load for 4 hours, on half load for 6 hours and one tenth load for 14 hours per day. Determine the "All day efficiency" of each transformer. **(10 Marks)**

4 a. Derive an expression for the copper savings in a autotransformer as compared with two winding transformer. **(04 Marks)**

b. Explain with the help of connection diagram and phasors, how a 2 phase supply can be obtained from a 3 phase supply. **(08 Marks)**

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c. Two electric furnaces are supplied with 1 phase current at 80V from a 3 phase, 11000 V system by means of two single phase SCOTT connected transformers with similar secondary windings, when the load on one furnace is 500 kW and on the other 800 kW, what current will flow in each of the 3 lines i) at Upf and ii) 0.8 pf (lag). **(08 Marks)**

5 a. Explain with suitable sketches the construction of squirrel cage and slipring induction motor. State the merits and demerits of each type. **(08 Marks)**

b. Prove that rotor copper losses are proportional to slip for constant rotor input. **(04 Marks)**

c. The useful full load torque of 3 phase, 6 pole, 50Hz induction motor is 162.84 Nm. The rotor is observed to make 90 cycles per minute. Calculate i) Motor O/P ii) Cu losses in rotor iii) motor i/p iv) efficiency, if mechanical torque lost in windage and friction is 20.36 Nm and stator losses are 830 W. **(08 Marks)**

6 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 are determined from test results? **(10 Marks)**

b. A 415V, 29.84 kW, 50Hz, delta connected motor gave the following test data.
No – load test : 415V, 21A, 1250W
Blocked rotor test : 100V, 45A, 2730W.
Construct the circle diagram and determine i) Line current and power factor for rated output ii) the maximum torque. Assume stator and Rotor copper losses are equal at stand still. **(10 Marks)**

7 a. Describe the constructional features of a double cage inductor motor and explain its operation. Draw the equivalent circuit of motor and speed torque characteristics. **(10 Marks)**

b. Explain why single phase induction motor is not self starting. Describe any one method of starting of a single phase induction motor. **(05 Marks)**

c. A 250 watts, 230 volts, 50Hz, capacitor start motor has the following constants for the main winding $Z_m = (4.5 + j\ 3.7)$ ohm and auxiliary winding $Z_a = (9.5 + j\ 3.5)$ ohm. Determine the values of starting capacitor to achieve a phase difference of 90^0 between the currents of two winding at starting. **(05 Marks)**

8 a. State the different methods of speed control of 3 phase induction motor and discuss in detail any two methods. **(10 Marks)**

b. Write short notes on :
i) Voltage build up in an induction generator.
ii) Parallel operation of single phase transformers. **(10 Marks)**