USN | | | | | | | | | | |

06EE46

Fourth Semester B.E. Degree Examination, Dec.09/Jan.10
Transformers and Induction Machines

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What are the difference between shell type and care type transformer. **(04 Marks)**

b. What is an auto transformer? Derive an expression for the saving of copper when an auto transformer is used and hence mention its applications. **(10 Marks)**

c. Draw the vector diagram of an practical transformer for i) lagging pf load, ii) leading pf load iii) unity pf load. **(06 Marks)**

2 a. What are the losses in a transformer? How to reduce these losses? Derive condition for maximum efficiency. **(08 Marks)**

b. A 10 KVA, 2500/250V, 1 – ϕ transformer gave the following test results :
O.C. test : 250 V, 0.8V, 50W
S.C. test : 60V, 3A, 45W
i) Calculate the efficiency at 75% of F.L and 125% of F.L, at 0.8 pf lag.
ii) Calculate the load KVA at which maximum efficiency occurs and also the value of maximum efficiency at 0.8 pf.
ii) Compute the voltage resolution and secondary terminal voltage under rated full load at i) 0.8 pf lag and ii) 0.8 pf leading. **(12 Marks)**

3 a. With neat circuit diagram explain in detail Sumpner's test for determining the efficiency and voltage resolution of a transformer. Mention its advantages and disadvantages. **(10 Marks)**

b. Two 250 KVA transformers supplying a network are connected in parallel on both primary and secondary sides. Their voltage ratios are same. The resistance drops are 1.5% and 0.9% and the reactance drops are 3.33% and 4% respectively. Calculate the KVA loading on each transformer and its power factor when the total load on the transformers is 500 KVA and at 0.707 pf lagging. **(10 Marks)**

4 Write short notes on :

a. Parallel operation of two 1 – ϕ transformer with equal voltage ratio.

b. Scott connection

c. Open delta or V- V connection

d. Variable frequency transformer. **(20 Marks)**

PART – B

5 a. With 3 – ϕ, flux wave diagram and vector diagram explain how you obtain rotating magnetic field in a 3 – ϕ I.M. and also explain the production of torque. **(10 Marks)**

b. A 3 – phase 4 pole, 50 Hz star connected induction motor running on full load develops a useful torque of 300 Nw-m. The rotor emf is completing 120 cycles per minute. If torque lost in friction is 50 Nw-m. calculate i) slip ii) net output power iii) rotor copper loss/ph iv) rotor efficiency v) rotor resistance /ph if rotor current is 60 A in running condition. **(10 Marks)**

6 a. Explain how the performance of 3-ph induction motor is predetermined using the circle diagram by conducting the necessary test. **(10 Marks)**

b. Explain the necessity of a starter for a 3-ph induction motor. Name the different methods of starting a squirrel cage induction motor. Explain star delta starter of 3-ph squirrel cage I.M. with a suitable diagram. **(10 Marks)**

7 a. A 440V, 3 – ϕ, 8 pole, 50Hz 40kW, star connected three phase I.M. has the following parameters $R_1 = 0.1\Omega$, $X_1 = j0.4\Omega$, $R_2^1 = 0.15\Omega, X_2^1 = j0.44\Omega$. The stator core loss is 1250W while mechanical loss is 1000 watts. It draws a no load current of 20A at a pf of 0.09 lagging while running at a speed of 727.5 rpm calculate

i) Input line current and pf
ii) Torque developed
iii) Output power
iv) Efficiency

Use approximate equivalent circuit. **(10 Marks)**

b. With a neat sketch explain the working of a double cage induction motor. Draw its equivalent circuit and torque –slip characteristic. **(10 Marks)**

8 Write short notes on :

a. Double field revolving theory is a 1 – ϕ I.M.
b. Cogging and crawling
c. Speed control of 3 – ϕ squirrel cage I.M.
d. 1 – ϕ Capacitor start motor. **(20 Marks)**

* * * * *