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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; June - 2017

Electrical Machines - I

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. With a neat sketch, explain the working of a constant voltage transformer. 6

b. Show that an auto transformer will result in saving copper in place of two winding transformer. 6

c. The no load current of transformer is 5 A at 0.3 pF when supplied at 230 V, 50 Hz. The number of turns on primary winding is 200. Calculate; 8

i) The maximum value of flux in the core ii) The core loss iii) The Magnetizing current.

2 a. Derive EMF equation of single phase transformer. Draw the vector diagram of practical transformer for leading power factor. 7

b. Develop the exact equivalent circuit of single phase transformer. From this derive approximate and simplified equivalent circuit of a transformer. 7

c. A 230/460 V transformer has primary resistance of 0.2 Ω and reactance of 0.5 Ω the corresponding values for the secondary are 0.7 Ω and 1.8 Ω respectively. Find the secondary terminal voltage and supplying 10 A at 0.8 pF Lagging. 6

UNIT - II

3 a. Derive an expression for load division between two dissimilar transformers connected in parallel with unequal voltage ratios. 10

b. A transformer has its efficiency of 0.98 at 15 kVA at UPF. During the day it is loaded as follows: 10

12 hours – 12 kW at pF 0.5,

6 hours – 12 kW at pF 0.8,

6 hours – 18 kW at pF 0.9. Find the all day efficiency.

4 a. Explain the sumpners test for testing two 1- ϕ transformer. Also explain why this is beneficial for finding efficiency of transformer. 10

b. A 20 kVA, 2200/220 V, 50 Hz single phase transformer gave the following readings : 10

OC test	220 V	4.2 A	148 W
SC test	86 V	10.5 A	360 W

Determine;

i) The equivalent resistance and reactance referred to secondary

ii) The voltage regulation at full load, 0.8 pF lagging

iii) The efficiency at full load, 0.8 pF lagging.

Contd…2

UNIT - III

5 a. Explain with necessary diagram, how two phase transformers can be used to convert a three phase supply to a two phase supply. If the load is balanced on side show that it will be balanced on other side. 8

b. What are the advantages of single 3 phase transformers units over a bank of single phase transformer? 5

c. A 3 phase, 100 kVA, 6600/1100 V transformer is delta connected on the primary and star connected on the secondary. The primary resistance per phase is 1.8 Ω and secondary resistance per phase is 0.025 Ω. Determine the efficiency when the secondary is supplying full load at 0.8 pF and the iron loss is 15 kW. 7

6. a With a neat diagram, explain : 10

i) Open Delta or V-V connection ii) Delta-delta connection.

b. A 3ϕ transformer as delta connected primary and a star connected secondary working on 50 Hz, 3ϕ phase supply. The line voltage of primary and secondary is 3300 V and 400 V respectively. The line current on the primary side is 12 A and secondary as a balanced load at 0.8 lagging pF. Determine the secondary phase voltage line current and the output. 10

UNIT - IV

7 a. Show that a rotating magnetic field can be produced by the use of 3ϕ current of equal magnitude. 8

b. State the different method of speed control of 3ϕ induction motor and discus in detail any one method. 6

c. A 1000 V, 50 Hz, 3ϕ induction motor has connected to stator. The ratio of stator to rotor turns is 3.6. The standstill impedance of rotor per phase is 0.01+ J0.2 Ω. Calculate. 6

i) Rotor current at start ii) Rotor pF at Start iii) Rotor current at slip is 3%.

8 a. Draw torque-slip characteristics of inductor-machines. Show breaking, motoring and generating region. 7

b. Explain with the help of neat sketches the difference between 3ϕ slip ring induction motor and 3ϕ squirrel cage induction motor 7

c. A 400 V, 4 poles, 3ϕ, 50 Hz star connected induction motor has a rotor resistance and reactance per phase equal to 0.01 Ω and 0.1 Ω respectively. Determine starting torque. Assume ratio of stator to rotor turns as 4. 6

UNIT - V

9 a. Explain why single phase induction motor is not self starting. Describe any one method of starting of a single phase induction motor. 10

b. Discuss the procedure for No Load test and blocked rotor test on a 3ϕ induction motor. How are parameters of equivalent circuit determined from test results? 10

10. Write short notes on : 20

i) What are the limitations and application of shaded pole induction motor

ii) Phenomenon of cogging and crawling in 3ϕ induction motor

iii) Double revolving field theory of single phase induction motor.

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