NEW SCHEME

EE64

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Sixth Semester B.E. Degree Examination, July/August 2005

Electrical & Electronics Engineering

Transformers and Induction Mechanics

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

Note: ***Answer any FIVE full questions.***

1. (a) Develop the phasor diagram of a single phase transformer under lagging p.f. load. **(5 Marks)**

(b) Draw the equivalent circuit of a transformer and describe briefly the various parameters involved in it. **(5 Marks)**

(c) A single-phase, 1100/220V transformer gave the following test results.

i) 1100V., 0.5A, 55W. on *hv* side, *lv* side being open circuited.

ii) 10V., 80A, 400W. on *lv* side, *hv* side being short circuited.

Draw the equivalent of the transformer and find the regulation and efficiency when supplying 100A at 220V 0.8p.f. lag. **(10 Marks)**

2. (a) Derive an expression for load division between two dissimilar transformers connected in parallel with unequal voltage ratios. **(10 Marks)**

(b) A 5kVA, single phase transformer has a core loss of 40W and full load ohmic loss of 100W. The daily variation of load is as follows

7AM to 1PM - 3kW at 0.6p.f.
1PM to 6PM - 2kW at 0.8p.f.
6PM to 1AM - 6kW at 0.9p.f.
1AM to 7AM - No load.

Determine the all day efficiency of the transformer. **(10 Marks)**

3. (a) What is an auto-transformer? Derive an expression for the saving of copper in an auto-transformer as compared to an equivalent two winding transformer. What are the advantages and limitations? **(10 Marks)**

(b) Two electric furnaces are supplied with single-phase current at 80V. from a 3 ph. 11kV. system through Scott connected transformers. The load on teaser secondary is 500 kW and on the main transformer secondary is 800 kW. Determine the line currents on the primary.

i) at u.p.f ii) 0.5 p.f. **(10 Marks)**

4. (a) Starting from the fundamentals develop the equivalent circuit of a poly phase induction motor and also draw the phasor diagram when the motor is driving a load. **(10 Marks)**

(b) The power input to a 500V. 50 Hz, 6 pole 3 ph. IM. running at 975 rpm is 40 kW. The stator losses are 1kW and friction and windage losses total are 2kW. Calculate : **(10 Marks)**

i) The slip ii) The rotor copper loss
iii) The efficiency iv) The shaft torque.

5. (a) With a neat sketch explain the working of a double cage IM. Draw its equivalent circuit. **(8 Marks)**

(b) A 3ph. 400V., 20hp, 50Hz star connected IM, gave the following test readings (line-values)

No load : 400V., 1250 W, 9A

Blocked rotor : 150 V., 4000 W., 38 A.

Stator copper loss equal to rotor copper loss at stand still. Draw the circle diagram and estimate :

i) Full load current

ii) Full load p.f

iii) Full load stiop

iv) ratio of maximum torque to full load torque. **(12 Marks)**

6. (a) Describe the different speed control methods of a 3-ph induction motor. **(10 Marks)**

(b) With the help of a neat diagram explain the working of a star-delta starter to start a 3-ph induction motor. **(6 Marks)**

(c) A 3-ph induction motor in a short circuit current equal to 4 times the full load current. Determine the starting torque as a percentage of full load torque if full load slip is 2.5%. **(4 Marks)**

7. (a) Explain double field revolving theory as applied to a single phase induction motor and prove that it cannot produce any starting torque. **(10 Marks)**

(b) With neat sketches explain the construction, working and applications of

i) Split phase and

ii) Capacitor start single phase induction motors. **(10 Marks)**

8. Write notes on any FOUR of the following :

(a) Cooling of transformers

(b) Polarity test

(c) Sumpner's test

(d) Losses in induction motor

(e) Cogging and crawling

(f) Induction generator. **(4×5=20 Marks)**

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