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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, APRIL – 2020

INDUCTION MACHINES

[Maximum Marks: 75] [Time: 2.15 Hours]

PART-A

(Answer ***any three*** questions in one or two sentences. Each question carries 2 marks)

I. 1. Write the basic principle of an auto transformer.

2. Define an ideal transformer.

3. Draw the equivalent circuit of an unloaded transformer.

4. State the principle of operation of a three phase Induction motor.

5. List various methods of slip measurement. (3 x 2 = 6)

PART-B

(Answer any ***four*** of the following questions. Each question carries ***6*** marks)

II 1. Describe the construction of a single phase, core type transformer.

2. Discuss the power loss and its components in a loaded transformer.

3. Show that, zero voltage regulation is possible if power factor is equal to the ratio of secondary winding resistance (r_2) and leakage reactance (x_2) of the given transformer.

4. Rotor resistance of a three phase induction motor is changed from r_2 to R_2, ($R_2 < r_2$). Discuss the effect of change in rotor resistance on its Torque-speed characteristics.

5. Show the various stages of power flow in a three phase induction motor with a sketch and write power balance equation.

6. Prepare a list of meters and equipment required to conduct blocked rotor test at 1.25 times of full load current, on a three phase, 415V, 50Hz, 1480 rpm, class A, 5hp, slip ring induction motor.

7. Draw the equivalent circuit of a double cage three phase induction motor. (4 x 6 = 24)

PART-C

(Answer ***any of the three units*** from the following. Each full question carries 15 marks)

UNIT – I

III (a) Draw the phasor diagram of a real, single phase transformer with R-L load. (7)

(b) The primary supply voltage of a single phase transformer is changed by 30% above its rated value. Discuss the effect of change in voltage on its secondary voltage, power loss and input power factor. (8)

OR

IV (a) Derive the emf equation of a shell type, two winding transformer. (7)

(b) Calculate equivalent impedance referred to primary and total copper loss of a 100kVA, 2200/440V transformer. The primary and secondary winding resistances are 0.3 and 0.01 ohm respectively and primary and secondary leakage reactance are 1.1 and 0.035 ohm respectively. (8)

UNIT - II

V (a) No load and short circuit test data of a single phase 2200/200V, 50Hz, 20kVA transformer is given below. Calculate efficiency if the connected load is of R-L type with a power factor of 0.8.

OC test data: 2200V, 220W

SC test data: 240W (with short circuit current equal to full load current) (7)

(b) Write the major causes of temperature rise of transformers on load and suggest suitable cooling methods. (8)

OR

VI (a) Show that the saving of copper with an auto transformer is (1-k) W_2; (k = secondary to primary voltage ratio and W_2 = weight of two winding transformer of same rating). (7)

(b) Draw the connection diagram of a three phase, group 1, Delta-delta transformer formed by banking three identical single phase transformers. (8)

UNIT- III

VII (a) Explain Torque-slip characteristics of three phase Induction motor. (7)

(b) A three phase 4 pole, 50Hz, star connected motor is supplying its rated load at 1440 rpm. The per unit rotor resistance is 0.2 ohm per phase and stand still per unit reactance is 1 ohm per phase. The rotor induced emf at stand still is 120V per phase. Calculate torque (N.m) developed at the shaft. (8)

OR

VIII (a) Draw the phasor diagram of a fully loaded three phase squirrel cage induction motor. (7)

(b) Discuss the various power losses and their causes in a three phase wound rotor induction motor which is supplying 75% of rated load. (8)

UNIT - IV

IX (a) Draw separate connection diagrams required to conduct no – load test and blocked rotor test on a three phase 415V, 5kW.50Hz Squirrel cage induction motor. (7)

(b) Illustrate the method of drawing circle diagram from OC and SC test data (8)

OR

X (a) Explain any two starting method suitable to a three phase, 415V, 20HP squirrel cage induction motor. (7)

(b) Discuss the Scherbius speed control method for three phase induction motor. (8)
