

TED (15) -5031  
(Revision- 2015)

**A22-06371**

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/  
COMMERCIAL PRACTICE –APRIL -2022.

**INDUCTION MACHINES**

(Maximum Marks : 100)

[Time : 3 hours]

**PART-A**  
(Max. Marks:10)

Marks

**I.** Answer **all** the questions in one or two sentences. Each question carries 2 marks.

1. State transformation ratio and turns ratio of a transformer.
2. Define all day efficiency of a power transformer.
3. Draw the basic power flow diagram of an induction motor.
4. List any four application of Induction Motor.
5. List any four connections used in three phase power transformer.

(5x2=10)

**PART - B**  
(Max. Marks: 30)

**II** Answer **any five** of the following questions . Each question carries 6 marks.

1. Derive the emf equation of an ideal transformer.
2. Explain any four cooling methods used in power transformer.
3. An 8-pole alternator runs at 750 rpm and supplies power to a 6-pole induction motor which has full load slip of 3%. Find the full load speed of the induction motor and the frequency of its rotor emf.
4. Describe any two methods for measuring slip in an induction motor.
5. List any six methods for speed control of induction motor.
6. Derive an equation for torque of an induction motor.
7. Explain why territory winding is required in a three phase transformer.

(5x6 =30)

**PART - C**  
(Max. Marks: 60)

(Answer **one full** question from each unit. Each full question carries 15 marks)

**UNIT I**

- III** a) A 50Hz, single phase transformer has a turn ratio of 6. The resistances are  $0.9\Omega$  and  $0.03\Omega$  and reactance are  $5\Omega$  and  $0.13\Omega$  for high voltage and low voltage winding respectively. Find (a) the voltage to be applied to the high voltage side to obtain full load current of 200 A in the low voltage winding on short circuit. (b) the power factor on short circuit. (8)
- b) Draw the sketch of a power transformer and explain the main parts. (7)

**OR**

- IV** a) Sketch the vector diagram of an ideal transformer when connected to an inductive load and explain the changes in primary and secondary current. (8)
- b) The no load current of a transformer is 5A at 0.2 power factor when supplied at 240V, 50Hz. The number of turns on the primary winding is 250. Determine (a) the maximum value of flux in the core, (b) the core loss and (c) magnetizing current. (7)

**UNIT- II**

- V** a) Derive an equation to determine the efficiency and regulation of transformer from open circuit and short circuit tests. (8)
- b) Describe the working of instrument transformer and their applications. (7)

**OR**

- VI** a) A single phase 1100/220V transformer on which the following result were obtained.
- (i) 1100V, 0.5 A, 55W on primary, secondary being open circuited.
- (ii) 10V, 80A, 400W on low voltage side, high voltage being short circuited.

Calculate the voltage regulation and efficiency for the above transformer when supplying 100A at 0.8 power factor lagging. (8)

- b) Show the relation between saving of copper in autotransformer and ordinary transformer. (7)

### UNIT- III

- VII** a) Draw and explain Torque – Slip and Torque – Speed curves of a three phase induction motor. (8)
- b) The power input to the rotor of a 440V, 50Hz, 6 – pole, 3 – phase induction motor is 80KW. The rotor electromotive force is observed to make 100 complete revolutions per minute. Calculate (i) slip (ii) the rotor speed (iii) the mechanical power developed (iv) the rotor copper loss and (v) the rotor resistance per phase if the rotor current is 65 A. (7)

**OR**

- VIII** a) Draw and explain the vector diagram of an induction motor. (8)
- b) The rotor resistance and stand still reactance per phase of a 3 – phase, slip ring induction motor are  $0.02\Omega$  and  $0.1\Omega$  respectively. What should be the value of the external resistance per phase to be inserted in the rotor circuit to give maximum torque at starting? (7)

### UNIT – IV

- IX** a) With a neat sketch explain the starting of a squirrel cage induction motor connected with a Direct on Line (DOL) starter. (8)
- b) Describe the construction and working of double squirrel cage motor. (7)

**OR**

- X** a) A 400V, 3 phase delta connected induction motor gave the following results on no load and short circuit tests (line values),  
No load test : 400V; 3.0A;600W  
Short circuit test : 200V; 12.0A; 1660W  
The friction and windage losses amount to 183 watts. Determine power and magnetizing components of no load current, no load power factor, no load resistance and reactance, equivalent resistance and reactance per phase as referred to primary. (8)
- b) Describe the electrical braking of poly phase induction motors. (7)

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