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Total Number of Pages : 02

B.Tech  
PEE3I103

3<sup>rd</sup> Semester Back Examination 2019-20

ELECTRICAL MACHINES - I

BRANCH : ELECTRICAL

Max Marks : 100

Time : 3 Hours

Q.CODE : HB891

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- Under what condition transformer will operate at leading power factor.
- Give the expression of copper savings in auto transformer as compare to two winding transformers.
- Why the rotor slots of a 3-phase induction motor are skewed?
- Explain why the no load current of an induction motor is much higher than that of an equivalent transformer.
- What is the function of capacitor in single phase induction motor?
- Why it is mandatory to use low power factor watt meter during no-load test of 3 phase induction motor?
- What is leakage reactance drop? Explain.
- Mention the different types of three phase transformer connection.
- Why all-day efficiency is lower than commercial efficiency?
- What are the conditions for parallel operation of a transformer?

Part- II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Draw the equivalent circuit diagram of single-phase transformer referred to Low voltage side and explain in details of each components.
- Where the damper windings are located? What are their functions?
- A 120kVA, 6600/400V, Y/Y, 3-phase, 50Hz transformer has a iron loss of 1600W. The maximum efficiency occurs at  $\frac{3}{4}$  full loads. Find the efficiency of the transformer at
  - Full load and 0.8 pf
  - The maximum efficiency at unity pf.
- Mention the different phasor group connections for 3 phase transformer and Explain any one of the group.
- Derive an expression for the currents and load shared by two transformers connected in parallel supplying a common load when no load of these are equal.
- Obtain the equivalent circuit of a 200/400V,50Hz, single phase transformer from the following test data :  
OC test: 200V,0.7A,70W on LV side  
SC test: 15V,10A,85W on HV side

- g) A 3-phase induction motor has a starting torque of 150% and maximum torque of 250% of full load torque. Neglect stator resistance and assume constant rotor resistance. Compute (a) Slip at maximum torque (b) Full load slip
- h) Explain effect of unbalance voltages & frequency variation on operation of induction motor.
- i) Explain torque-slip characteristic of three-phase induction motor.
- j) Explain how a rotating magnetic field is produced in a three-phase induction motor.
- k) Draw and explain the Full load Phasor Diagrams of Single-Phase transformer for lagging, leading and Unity power factor loads
- l) Show that open delta connection has a KVA rating of 58% of the rating of the normal delta-delta connection. Also list the limitations of open delta connection

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Draw and explain the torque/slip curves of a three-phase induction motor for different values of rotor resistance. **(16)**
- Q4** Explain the different speed control methods of phase wound induction motor. **(16)**
- Q5** A100 kVA, 6.6kV/415V, single phase transformer has an effective impedance of  $(3+8j) \Omega$  referred to HV side. Estimate the full load voltage regulation at 0.8 pf lagging and 0.8 leading pf. **(16)**
- Q6** Derive the expression for air gap power, mechanical power developed and internal power for 3 phase induction motor. **(16)**