

Part-III

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

Q3

Define Voltage regulation and all-day efficiency of transformer.

(16)

A 15-kVA, 2300/230-V transformer is to be tested to determine its excitation branch components, its series impedances, and its voltage regulation. The following test data have been taken from the primary side of the transformer.

Open-circuit test	Short-circuit test
$V_{oc} = 2300 V$	$V_{sc} = 47 V$
$I_{oc} = 0.21 A$	$I_{sc} = 6.0 A$
$P_{oc} = 50 W$	$P_{sc} = 160 W$

- Find the equivalent circuit of this transformer referred to the high-voltage side.
- Find the equivalent circuit of this transformer referred to the low-voltage side.
- Calculate the full-load voltage regulation at 0.8 lagging power factor, 1.0 power factor, and at 0.8 leading power factor.
- Plot the voltage regulation as load is increased from no load to full load at power factors of 0.8 lagging, 1.0, and 0.8 leading.
- What is the efficiency of the transformer at full load with a power factor of 0.8 lagging?

Q4

Draw the exact equivalent circuit to show the stator, rotor and load resistance of a three phase induction motor.

(16)

A 10-hp, 4-pole, 440-V, 60-Hz, Y-connected, three-phase induction motor runs at 1725 rpm on full load. The stator copper loss is 212 W, and the rotational loss is 340 W. Determine (a) the power developed, (b) the air gap power, (c) the rotor copper loss, (d) the total power input, and (e) the efficiency of the motor. What is the shaft torque?

Q5

What are the different methods of speed control for three phase induction motor. Discuss the speed control by variable frequency control methods for considering variable mechanical load. Draw the torque speed characteristics for frequency control method.

(16)

Q6

Write down the construction and principle of operation of three phase transformer. Draw the different vector group connections and their phasor diagram of three phase transformer.

(16)