

EE/EX-404 ELECTRICAL MACHINE-I DEC 2013

Note Attempt any two parts from each question.

All questions carry equal marks.

1. (a) Explain the effect of saturation on exciting current and voltage of a transformer.
(b) State the various losses which take place in the transformer. On what factors do they depend? Explain the steps taken to minimize these losses.
(c) High voltage side short circuit test data for 20 kVA, 2300/230 V transformer are — Power = 250 W, current = 7.5 A, voltage = 50 V. Calculate the equivalent impedance, resistance, reactance referred to high voltage side. Find the transformer regulation at 0.7 lagging power factor. Derive any equation used.
2. (a) What is an open-delta system ? What are the applications of this system ?
(b) Draw and explain the circuit diagram of a transformer arrangement for converting from a 3-phase to a 2-phase supply.
(c) Explain the function and principle of operation of no-load and on-load tap changing transformer.
(a) Draw and explain the slip-torque characteristics of a typical induction motor. Mark the starting torque and maximum torque on the diagram so drawn. How do starting and maximum torques vary with the rotor resistance ?
(b) Describe the no-load test and blocked rotor test on an induction motor.
(c) The rotor resistance and reactance per phase of a 4-pole 50 Hz, 3-4) IM are 0.025 Ω and 0.12 Ω respectively. Make simplifying assumptions, state them and find (i) Speed at maximum torque
(ii) Find value of additional rotor resistance per phase required to give three-fourth of maximum torque at starting.
(a) Why a starter is necessary to start an induction motor ? Mention the various methods of starting.
(b) Differentiate between harmonic induction torque and harmonic synchronous torque developed in an induction motor. What are their effects ?
(c) Explain the phenomenon of cogging and crawling in squirrel cage IM.
5. (a) Explain the double-revolving field theory for single-phase IM.
(b) Describe the construction and working of a shaded pole motor.
(c) Draw and explain the phasor diagram of A.C. series motor.