

MASTER

Note Before:

1. All questions carry equal marks.
2. Question 1 is compulsory.
3. Attempt any 4 out of the remaining questions.

Question 1.

- A. In case of a transformer, write a detailed note on the different accessories and their functions.
- B. Explain in detail the effects of choice of specific magnetic and specific electric loading while designing a 3 phase Induction Motor

Question 2

- A. Explain with the help of a neat diagram the current distribution in the bars and end rings of a squirrel cage Induction Motor.
- B. Derive an expression for reluctance offered by a parallel sided slot with single conductor in a induction motor stator.

Question 3

- A. In case of a 3 phase induction motor with  $\sigma$  as its dispersion coefficient, show that
  - a. Maximum power factor =  $\frac{1-\sigma}{1+\sigma}$
  - b. Maximum power factor =  $\frac{\text{full load output} * (1+\sigma)}{2\sqrt{\sigma}}$

- B. Explain the method of calculating the magnetizing ampere turns for a tapered tooth. Hence or otherwise explain how to find out the ampere turns of all the teeth under one pole.

Question 4

- A. Estimate the stator core dimensions, number of stator slots and number of stator conductors per slot for a 100 kW, 3300 V, 50 Hz, 12 pole star connected slip ring induction mote. Assume the following data: average gap density = 0.4 Wb/m<sup>2</sup>, conductors per meter = 25,000 A/m, efficiency = 0.9, power factor = 0.9, and winding factor = 0.96. Choose the main dimensions to give best power factor. The slot loading should not exceed 500 ampere conductors.
- B. Two single phase transformers with AN cooling have linear dimensions in the ratio of x : 1. the two are designed to work at the same current density, flux density and frequency. Calculate their relative ratings and losses and total weights per KVA of these two transformers. Comment briefly on the temperature rise of the first transformer for increasing values of x.

Question 5

- A. Explain in detail the construction of a core of transformer using CRGO steel.
- B. Write a detailed note on the different types of windings used in a transformer.

Question 6

- A. In case of a transformer, write a detailed note on the different methods of cooling.
- B. Show that the cooling curve of electric machines is exponential in nature. Define cooling time constant.

Question 7

- A. Write a critical note on major and minor insulation of transformer.
- B. Derive the relation for the leakage reactance in case pf a shell type transformer.