

Total No. of Questions : 6]

SEAT No. :

P23

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TE/INSEM/APR-27

T.E. (Electrical) (Semester - II)

303149: DESIGN OF ELECTRICAL MACHINES

(2015 Pattern)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Elaborate on any two types of windings used in a transformer. [6]

b) What is a mitred joint? What are the benefits of using mitred joints? [4]

OR

Q2) a) Write the functions of (i) Off load tap changer (ii) Conservator. [4]

b) Derive the expression for heating curve with usual notations and hence define heating time constant. [6]

Q3) a) Write the procedure of design of tank with tubes and hence derive the expression for number of cooling tubes. [5]

b) Calculate the KVA output of a single phase transformer which has the following details: ratio of core height to distance between core centers is 2.8, ratio of diameter of circumscribing circle to distance between core centers is 0.56, ratio of net iron area to area of circumscribing circle is 0.7. current density = 2.3 A /mm<sup>2</sup>, window space factor = 0.27, frequency = 50 Hz, flux density = 1.2 Wb/m<sup>2</sup> and Distance between core centers = 0.4m. [5]

P.T.O.

OR

- Q4)** a) Derive the expression for output equation for a three phase transformer with usual notations. [5]
- b) The ratio of flux to full load mmf in a 400 KVA, 50 Hz in a single phase core type transformer is  $2.4 \times 10^{-6}$ . Calculate the net iron area and the window area if flux density is  $1.3 \text{ Wb/m}^2$ , current density =  $2.7 \text{ A/mm}^2$ , window space factor = 0.26. [5]
- Q5)** a) Draw and explain the generalized flow chart of design of transformer. [5]
- b) A 500 KVA, 11000/440V, three phase, delta/star transformer has HV turns = 1660, length of mean turn 93 cm, length of coil = 52 cm, the short circuit current is 20 times the rated current. Find the average radial force on the HV winding under short circuit conditions. [5]

OR

- Q6)** a) Write down the procedure to estimate the magnetizing component of no load current for a three phase transformer. [4]
- b) Discuss the various mechanical forces developed under short circuit conditions and also the measures to overcome it. [6]

