

[Time: Three Hours]

[Marks: 80]

**N.B.** 1. Question no. 1 is compulsory.

2. Attempt any THREE from the remaining questions.

3. Figure to right indicates full marks.

**Q.1** Solve any four questions.

- a) Explain the conditions for parallel operation of three phase transformer. [05]
- b) Explain why secondary winding of CT always be shorted. [05]
- c) Write short note on connection and phasor diagram of Dy1 transformer. [05]
- d) Which necessary data get from O.C. and S.C. test on single phase transformer. [05]
- e) Explain properties of magnetic materials required for electrical machine design. [05]

- Q.2** a) Prove that the copper saved in auto transformer is  $(1-k)$  times that of two winding transformer. [10]
- b) Explain Harmonics in transformer and state the causes of Harmonics. [10]

- Q.3** a) Derive the output equation of single phase and three phase transformer. [10]
- b) Two transformers A and B are joined in parallel to the same load. Determine the current delivered by each transformer, given: open circuit emf 6500 V for A and 6300 V for B. Equivalent leakage impedance in terms of the secondary =  $(0.2+j2)\Omega$  for A and  $(0.1+j1)\Omega$  for B. The load impedance is  $(8+j6)\Omega$ . [10]

- Q.4** a) Derive the equation to obtain approximate voltage regulation in single phase transformer. Also draw the phasor diagram. [10]
- b) Explain in detail the oscillating neutral in three phase transformer. [10]

- Q.5** a) Draw a diagram showing main dimensions of single phase and three phase core type transformer and write the equation for the same. [10]
- b) Explain the designing of cooling tubes and tank in transformer [10]

- Q.6** a) Explain the designing of core of a three phase transformer [10]
- b) A 500 KVA 6600/400 V, 50 Hz, Delta star, three phase core type transformer has the following data. [10]

Width of LV winding = 16 mm; Width of HV winding = 20 mm; height of coils=0.5m.

Length of mean turn = 0.8 m; HV winding turns = 900.

Width of duct between HV and LV winding=13mm. Calculate leakage reactance of transformer referred to HV side.