**[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.