Transformers

1. A resistive load of 1.6Ω is connected across the secondary terminals of a 10kV/400V transformer. If R_c = 50KΩ, X_m = 10KΩ, R_{1eq} = 50Ω and X_{1eq} = 80Ω calculate:

   i) The turns ratio
   ii) The output current (I_S)
   iii) The output voltage under load (V_S)
   iv) The iron and copper loss
   v) The magnetising current (I_m)
   vi) The Input Current (I_P)
   vii) The phasor diagram (include V_p, V_1, V_{R1eq}, V_{X1eq}, I_p, I_1, I_m) – drawn to scale

2. Determine the % Voltage Regulation and Efficiency of the transformer in question 1.

3. Determine the necessary secondary load resistance such that the transformer in question 1 operates at its maximum efficiency point.

4. Open-circuit and short-circuit tests were conducted on a 230/110V 5KVA single-phase transformer and the following results were obtained:

   Open-circuit Test:

   V_1 = 230V V_2 = 110V $I_1 = 2AP_{in}$ = 30W

   Short-circuit Test:

   V_1 = 40V I_1 = 22A P_{in} = 200W

   Calculate the parameters for the approximate equivalent circuit.

5. For the single phase transformer shown on Figure 1 estimate the maximum input voltage and current at a 50Hz supply frequency given a maximum flux density (B) of 1.3T and a maximum current density (J) of 2A/mm^2.

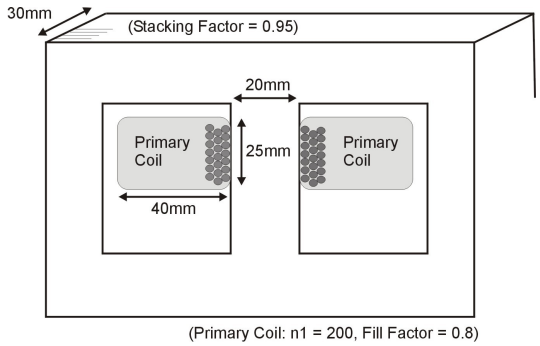

Figure 1

6. A three phase 12KV/6.6KV transformer is connected in a YΔ. Determine the phase shift between the input and output line voltages and estimate the Bank Ratio and Phase Ratio for the transformer.