Indian Institute of Technology Bombay
Department of Electrical Engineering EE
238: Power Engineering II
Spring semester, 2025
Assignment

Instructor: Prof. Sandeep Anand Date: 08/04/2024

Q1. A single-phase transformer is rated 110/440 V, 4kVA having leakage reactance at LT side is 0.2Ω. Find leakage inductance in per unit (pu). (**Ans:** $X_{p.u}$ =0.0661Ω)

Q2. In the network of Figure A, two single-phase transformers supply a 10 kVA resistance load at 200 V. Show that the p.u. load is the same for each part of the circuit and calculate the voltage at point D. (**Ans:** V_D=404.8V)

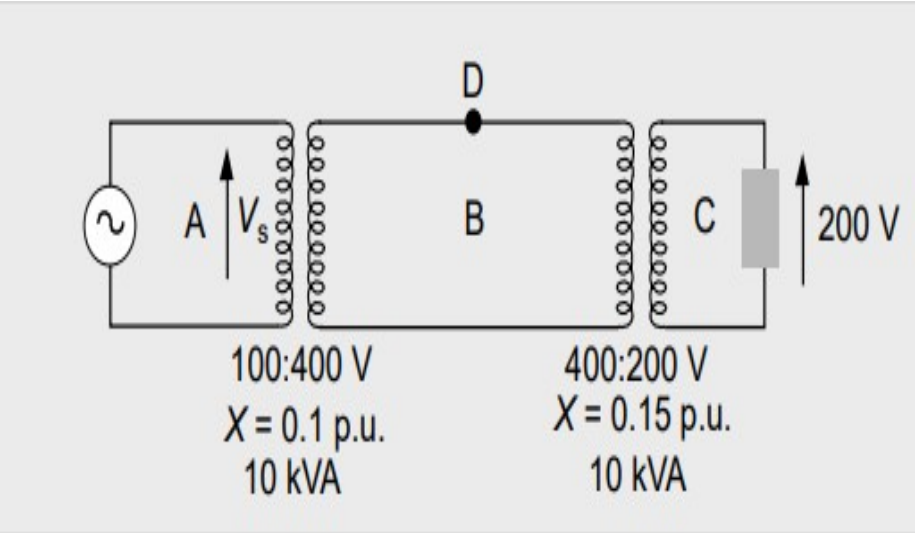

Figure A

Q3. A 1500 KVA, 6600 V, 3 phase star connected alternator with a resistance of 0.4Ω/ph and reactance 6 Ω/ph, delivers full-load current at power factor 0.8 lagging and normal rated voltage. Estimate terminal voltage for the same excitation and load current at 0.8 power factor leading.
(**Ans:** 8220 V)

Q4. A non-salient pole synchronous generator having synchronous reactance of 0.8 p.u. is supplying 1 p.u. power to a unity pf load at a terminal voltage of 1.1 p.u. Neglecting the armature resistance, the angle of the voltage behind the synchronous reactance (E_f) with respect to the terminal voltage in degree is _____ (**Ans** : 33.49°)

Q5. A synchronous generator is connected to an Infinite bus with excitation voltage Ef = 1.3 p.u. The generator has a synchronous reactance of 1.1 p.u. and is delivering real power (P) of 0.6 p.u. to the bus. Assume the Infinite bus voltage to be 1.0 p.u. Neglect stator resistance. The reactive power (Q) in p.u. supplied by the generator to the bus under this condition is _____ (**Ans**: 0.109 p.u)

Q6. A 100 MVA, 13.8 kV synchronous generator is operating at full load and 0.9 power factor lagging. If the terminal voltage drops by 5% due to load change, what should be the percentage increase in excitation (field current) to maintain constant terminal voltage? (assume linear magnetic characteristics). (**Ans.** 5.26%)

Q7. A 200 MVA synchronous generator has a governor droop setting of 4%. If the frequency drops by 1.5 Hz, calculate the change in mechanical power output. (**Ans.** 150MW)