

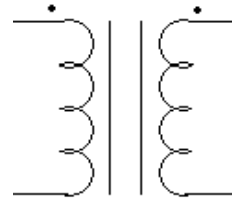
ECE 3600 Exam 2 given: Fall 20

(Some space between problems has been removed.)

1. a) (17 pts) You have a 500/150-V, 1.5-kVA transformer.

Can you use this transformer to transform 500 V to 350 V?

If yes, show the connections (include source and load) and compute the new VA rating.



b) Show the 500-V source and the load.

c) Could this transformer also be used to transform 400 V to 120 V ? If yes, what is the maximum real power that could be transformed at these voltages?

2. (24pts) A 400/100-V, 2.4-kVA transformer is subjected to an OC test and a SC test with the results below.

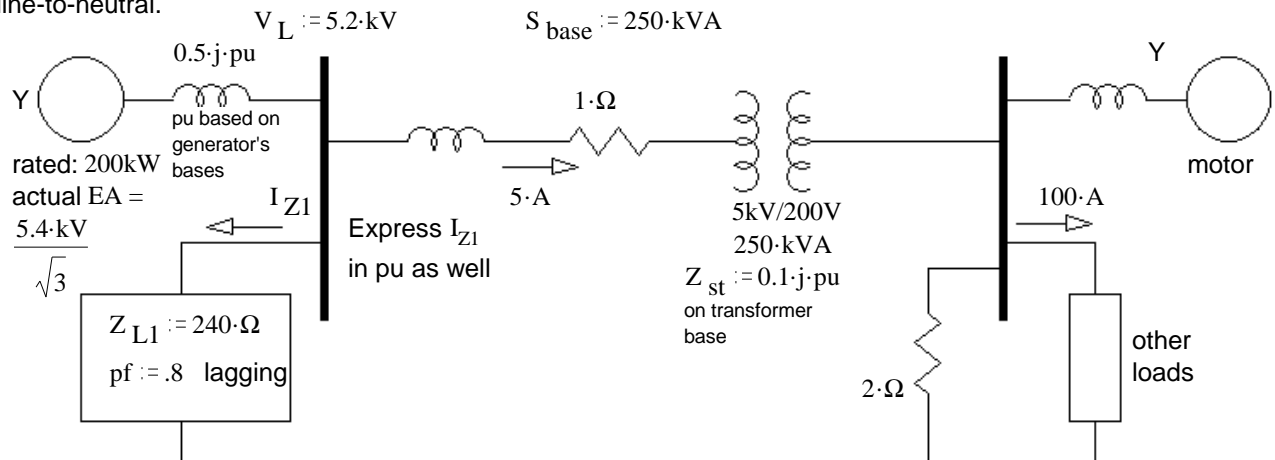
Draw a model of this transformer and find the values of all the elements of the model, including the turns ratio.

During the open-circuit test: $I_{OC} := 0.5 \cdot A$ $P_{OC} := 150 \cdot W$

During the short-circuit test: $V_{SC} := 20 \cdot V$ $P_{SC} := 60 \cdot W$

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3. (28 pts) A one-line, per-phase diagram is shown below. Using the S_{base} given, find all the bases and draw a per-phase, per-unit diagram. Include pu values for **all** the values given in the drawing below. E_A voltage is line-to-neutral.



Give phase angle for both Z_{L1} and I_{Z1}

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4. (31 pts) A 60 Hz, 2-pole, 3-phase, Y-connected synchronous generator supplies 120 kW of power to a 4.8 kV bus. The synchronous reactance (X_s) is $50 \Omega/\text{phase}$. The power angle (δ) is 14° . Find the following.
- The magnitude of the generator emf (E_A)

b) The total reactive power generated.

NOTE: This number is unrealistically big.

c) The operators are told to double the generated power, what do they do?

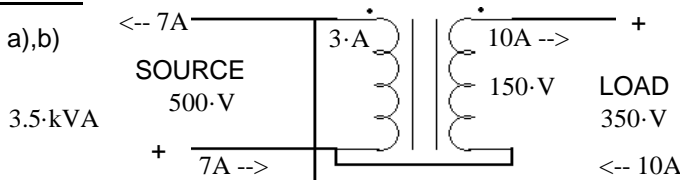
Use this new power for the rest of the problem.

d) The operators are told to generate the same reactive power as before (part b) what do they adjust?

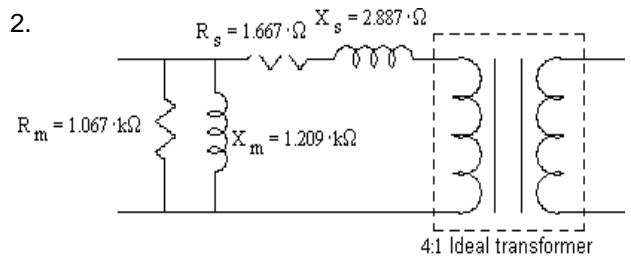
e) After making the adjustment of the previous part, find the new magnitude of the generator emf

Answers

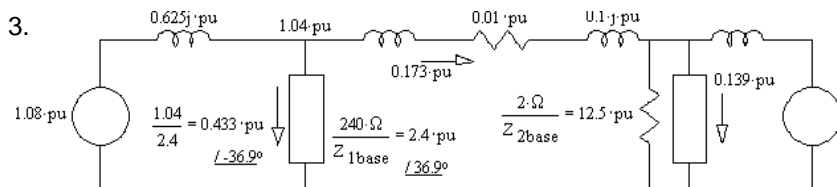
1. a), b)



2.



c) Original simple connections, 12 kW



4. a) 2983 V b) 20.5 kVAR

c) Increase the shaft torque from the prime mover

d) The DC field current e) 3234 V f) 26.5°