The Ohio State University
Department of Electrical Engineering

EE 341

Energy Conversion
Home work Set # 3

Print Your Name

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1. Solve Problem 2-1(text, page 133)

2-1. The secondary winding of a transformer has a terminal voltage of $v_S(t) = 282.8 \sin 377t$ V. The turns ratio of the transformer is 50:200 (a = 0.25). If the secondary current of the transformer is $i_S(t) = 7.07 \sin(377t - 36.87^o)$ A, what is the primary current of this transformer? What are its voltage regulation and efficiency? The impedances of this transformer referred to the primary side are

$R_{eq} = 0.05\Omega$ $\quad$ $R_C = 75\Omega$

$X_{eq} = 0.225\Omega$ $\quad$ $X_M = 20\Omega$

2. Solve Problem 2-3(text, page 134)

2-3. A 1000-VA 230/115-V transformer has been tested to determine its equivalent circuit. The results of the tests are shown below.

Open-circuit test	Short-circuit test
$V_{OC} = 230\,\text{V}$	$V_{SC} = 13.2\,\text{V}$
$I_{OC} = 0.45\,\text{A}$	$I_{SC} = 6.0\,\text{A}$
$P_{OC} = 30\,\text{W}$	$P_{SC} = 20.1\,\text{W}$

All data given were taken from the primary side of the transformer.

(a) Find the equivalent circuit of this transformer referred to the low-voltage side of the transformer.

(b) Find the transformer's voltage regulation at rated conditions and (1) 0.8 PF lagging, (2) 1.0 PF, (3) 0.8 PF leading.

(c) Determine the transformer's efficiency at rated conditions and 0.8 PF lagging.