KKR & KSR INSTITUTE OF TECHNOLOGY & SCIENCES
(Approved by AICTE, Delhi, Affiliated to JNTU, Kakinada)

ASIGNMENT-1

Faculty Name: **Dr. M. Amarendra** Subject name: **Electrical Machines-1**

Year/sem : **II B. Tech I SEM (R16)** Academic Year: **2017-18**

10 points

A cast-steel ring has a mean circumference of 80 cm and a cross-sectional area of 3.14 cm^2. An air – gap of 1mm length is cut-out in the ring. The ring is wound uniformly with a coil of 600 turns. Calculate the flux produced in the air – gap, if the exciting current is 2A? Neglect fringing andleakage.

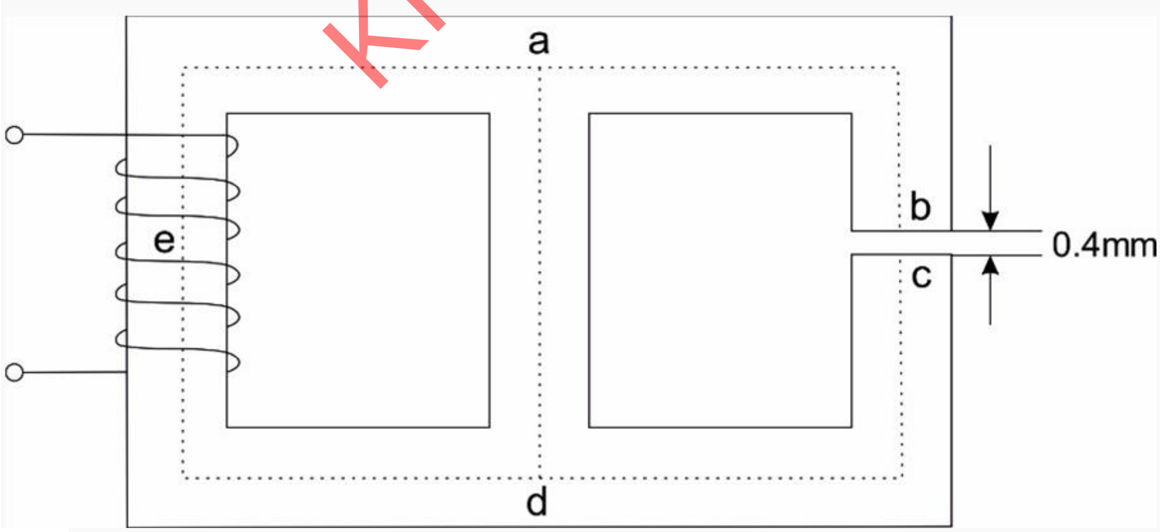
Magnetization data:

H(AT/m)	200	400	600	800	1000	1200	1400	1600	1800	2000
B (T)	0.10	0.32	0.60	0.90	1.08	1.18	1.27	1.32	1.36	1.40

- (•) 1.3 Wb
- ( ) 0.26 mWb
- ( ) 6.2 mWb
- ( ) 4.8 mWb

10 points

The magnetic circuit, made out of mild steel core is shown in figure.

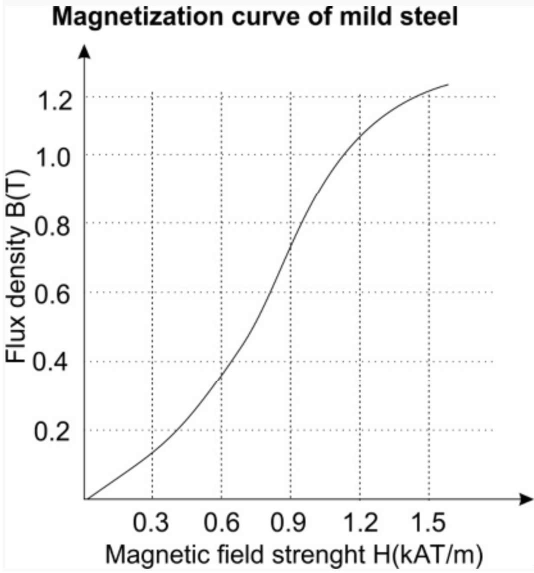


The dimensions are given below:

Length (ab + cd) = 40 cm Cross-sectional area = 30 cm^2

Length ad = 20 cm Cross-sectional area = 30 cm^2
Length aed = 40 cm Cross-sectional area = 30 cm^2

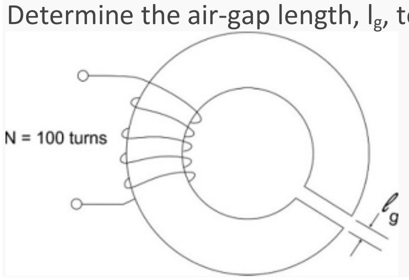
Determine the exciting coil mmf required to establish an air-gap flux of 0.6 m Wb. Neglect fringing and leakage.
The magnetization curve of mild steel is given below:



- 470 AT
- 207 AT
- 803 AT
- 1252 AT

10 points

The magnetic circuit shown in figure, has the following parameters
N = 100 turns
Core area, A_c = Air gap area, A_q = 5 cm^2
Relative permeability of core , μ_{core} = infinity
Determine the air-gap length, l_g, to provide a coil inductance of 10 mH.



- 1 cm
- 2 mm
- 0.1 mm

0.6 mm

10 points

The primary of a transformer has 200 turns and is excited by a 50 hz, 230 – V source. What is the maximum value of the core flux?

- 40.8 mWb
- 5.18 mWb
- 7 mWb
- 4 mWb

10 points

A voltage v = 166 sin(314t) + 20sin(942t) V is applied to the primary of a transformer. If the transformer has 100 turns in the primary, determine the rms value of the core flux. The leakage flux can be neglected.

- 4.6 mWb
- 3.7 mWb
- 2.8 mWb
- 8.3 mWb

10 points

A 20 – kVA, 50 – Hz,2000/200 V distribution transformer has a leakage impedance of 0.42 + j 0.52Ω in the high-voltage (HV) winding and 0.002 + j0.05 Ω in the low-voltage (LV) winding. It is employed to step down the voltage at the load-end of a feeder having an impedance of 0.15 + j 1.8 Ω. The sending-end voltage of the feeder is 2 kV. Find the voltage at the load end of the transformer when the load is drawing rated transformer current at 0.8 pf lagging. The voltage drops due to exciting current may be ignored.

- 195V
- 180V
- 133V
- 188V

10 points

A single-phase 2300/220 V, 50 Hz transformer has emf per turn of approximately 13 V. Calculate the cross-sectional area of the core in if the maximum flux density is 1.5 T.

- 38.2 m^2
- 56.1 m^2
- 25.61 m^2
- 16.67 m^2

10 points

A single-phase 33kVA, 1100/110 V, 50 Hz transformer has the following parameters:

Primary winding (HV side)-Resistance=2 Ω, leakage Reactance=6.2 Ω

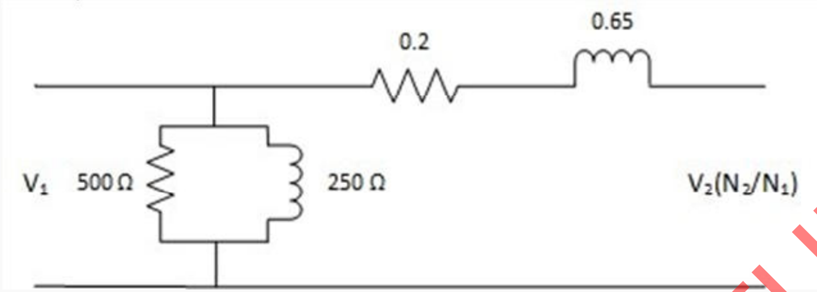
Secondary winding (HV side)-Resistance=0.05 Ω, leakage Reactance=0.06 Ω

Find the equivalent resistance and equivalent leakage reactance referred to primary

- 7 ohm and 12.2 ohm
- 10 ohm and 12.2 ohm
- 7 ohm and 15 ohm
- 10 ohm and 15 ohm

10 points

The equivalent circuit of a 250/2500 V transformer referred to the low voltage side is given below.

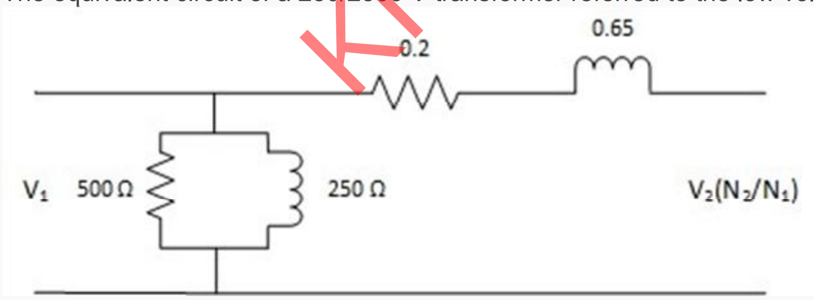


A load of 350+j210 Ω is connected. For a primary side input voltage of 250 V, compute the RMS value of primary current.

- 68 A
- 38 A
- 54 A
- 60 A

10 points

The equivalent circuit of a 250/2500 V transformer referred to the low voltage side is given below.



A load of 350+j210 Ω is connected. For a primary side input voltage of 250 V, compute the input power factor

- 0.68 lag
- 0.68 lead
- 0.81 lag
- 0.81 lead

You may submit any number of times before the due date. The final submission will be considered for grading.

Submit Answers

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ASIGNMENT-2

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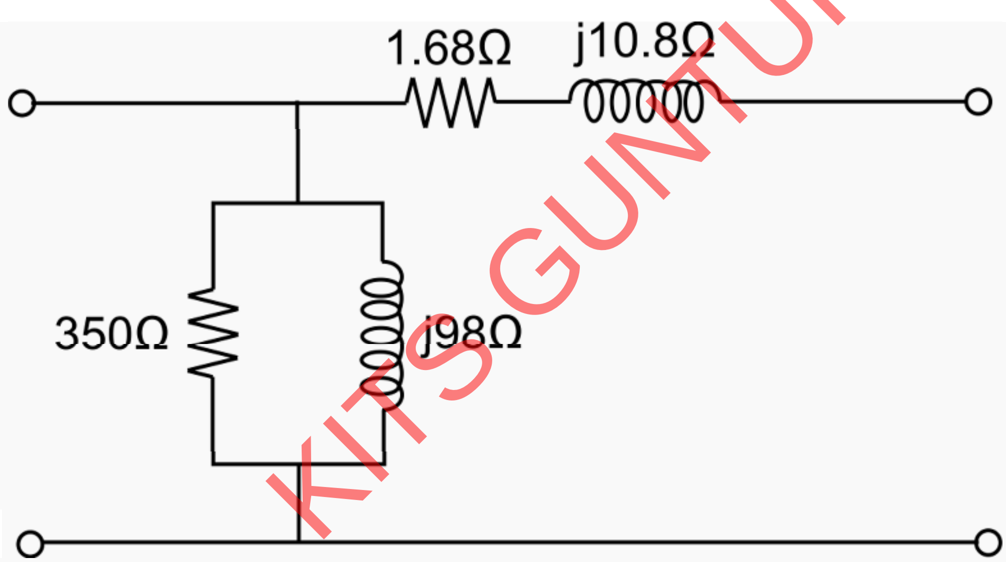
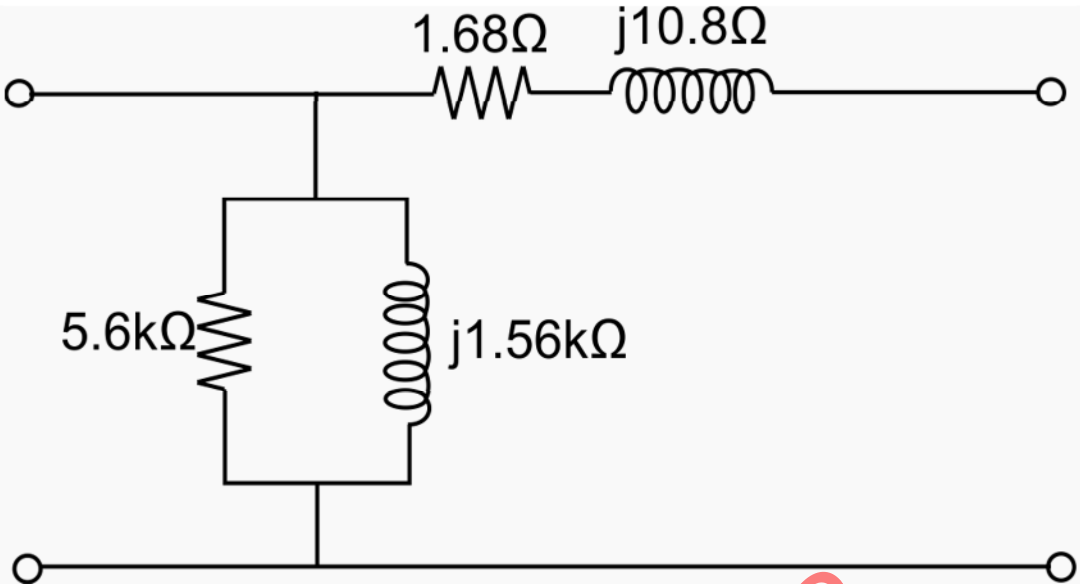
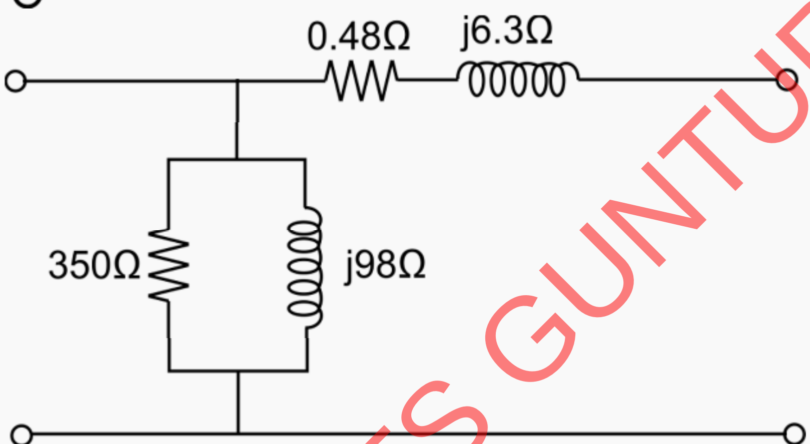
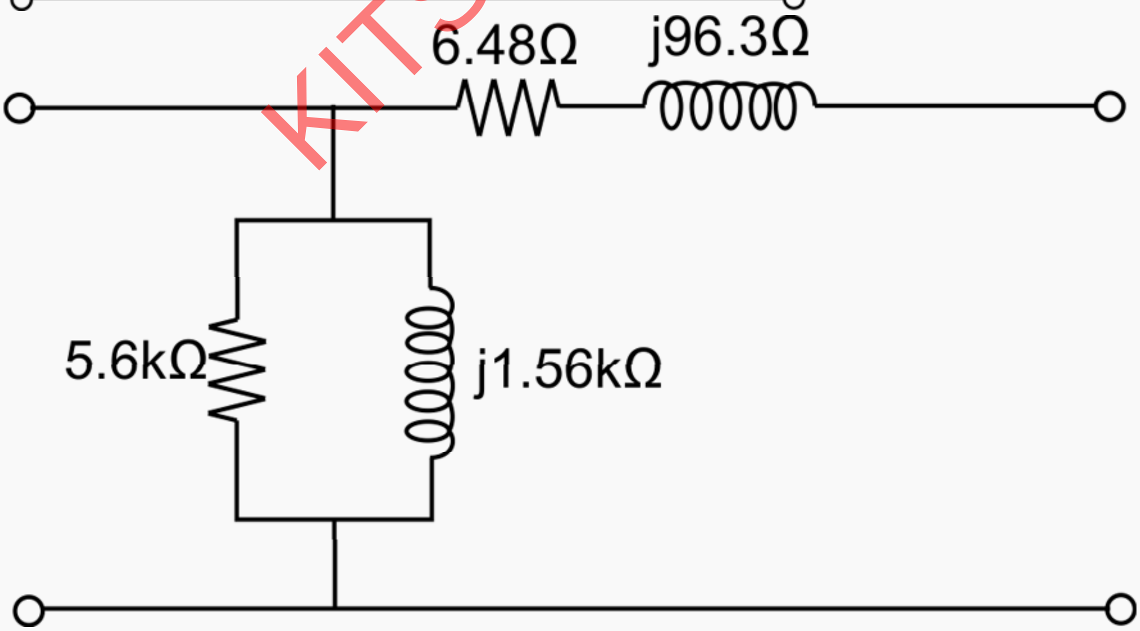
1) A 50 Hz, single phase transformer has primary to secondary turns ratio (N1/N2) equal to 4. The leakage impedance of the high voltage and low voltage windings are (0.4 + j6)Ω and (0.08 + j0.3)Ω respectively. The resistance accounting for core loss, Rc and magnetizing reactance, Xm referred to primary side are 350Ω and 98Ω respectively. Find the approximate equivalent circuit referred to primary side.




1.68Ω
j10.8Ω
5.6kΩ
j1.56kΩ


0.48Ω
j6.3Ω
350Ω
j98Ω


6.48Ω
j96.3Ω
5.6kΩ
j1.56kΩ

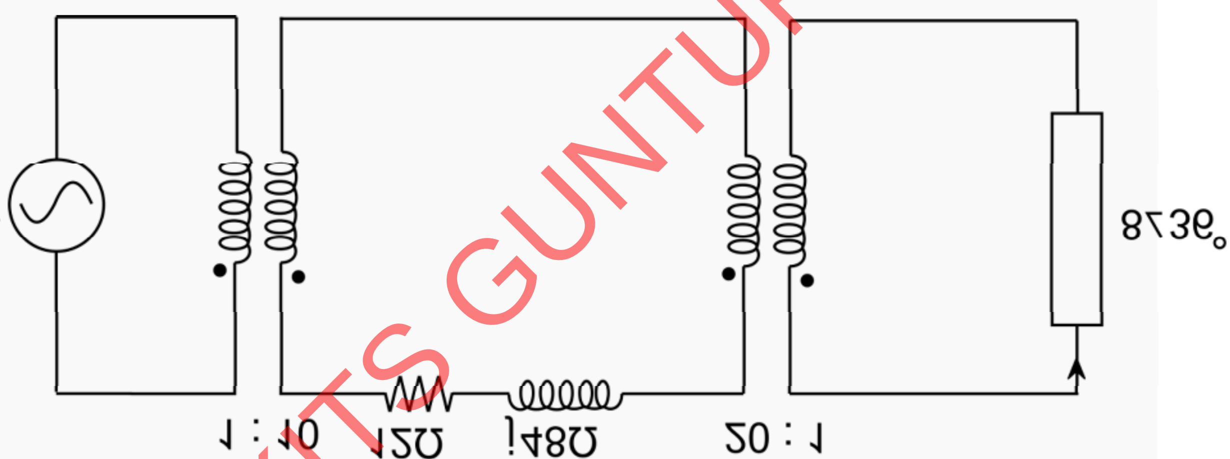
10 points

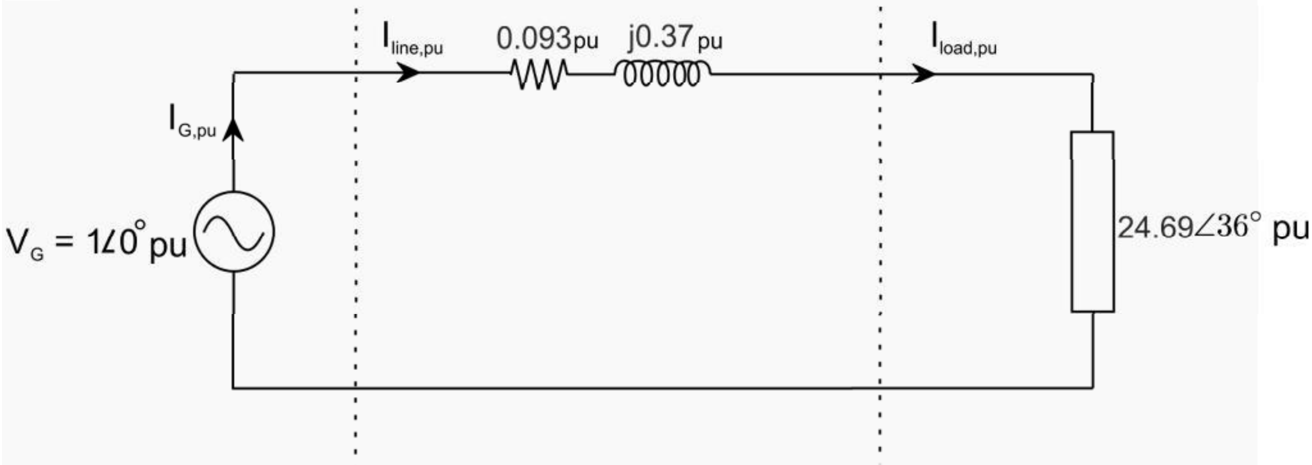
A 50 Hz, single phase transformer has primary to secondary turns ratio (N1/N2) equal to 8. The resistances are 0.2Ω and 0.02Ω and the reactances are 4Ω and 0.1Ω for high voltage and low voltage windings respectively. Find the voltage to be applied at the high voltage side to obtain a current of 160A in the low-voltage winding on short circuit?

- 1640.2 V
- 1680.64 V
- 210.8 V
- 13.12 kV

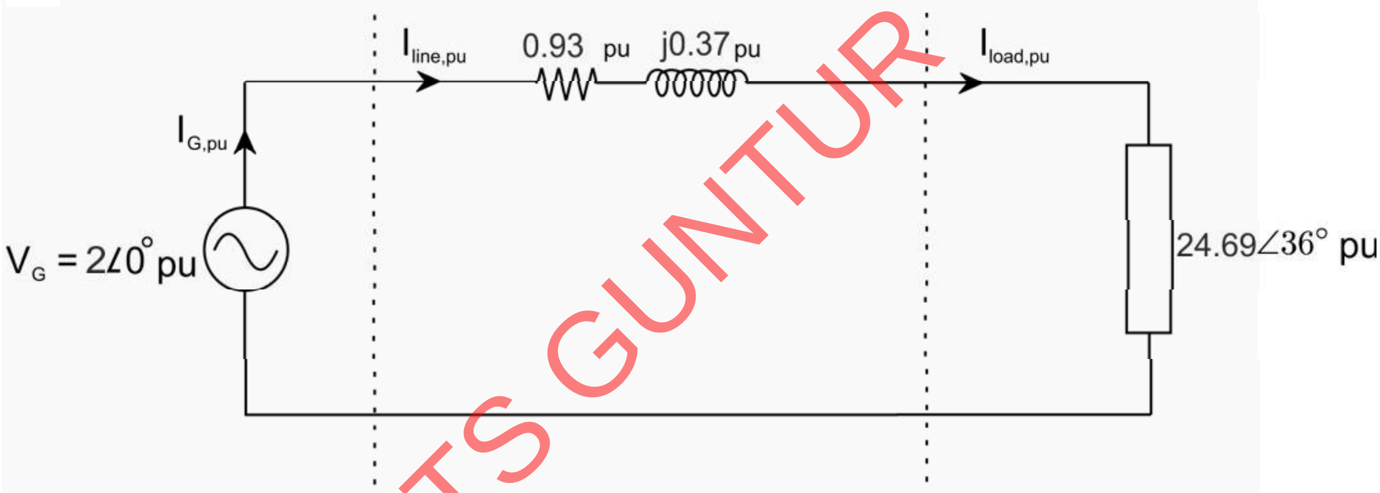
10 points

A simple power system is shown in figure. This system contains a 360V generator connected to an ideal 1:10 step-up transformer, a transmission line, an ideal 20:1 step-down transformer and a load. The impedance of the transmission line is 12+j48Ω, and the impedance of the load is 8∠36°Ω. Convert this system to its per unit equivalent circuit if base values for this system is chosen as 360V and 10kVA at the generator side.

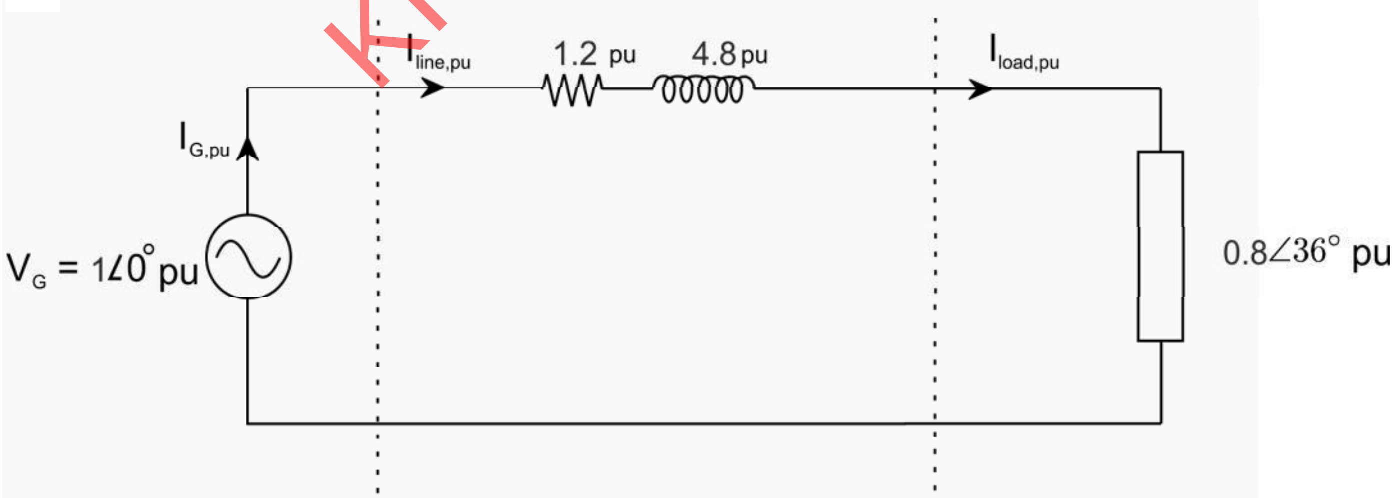




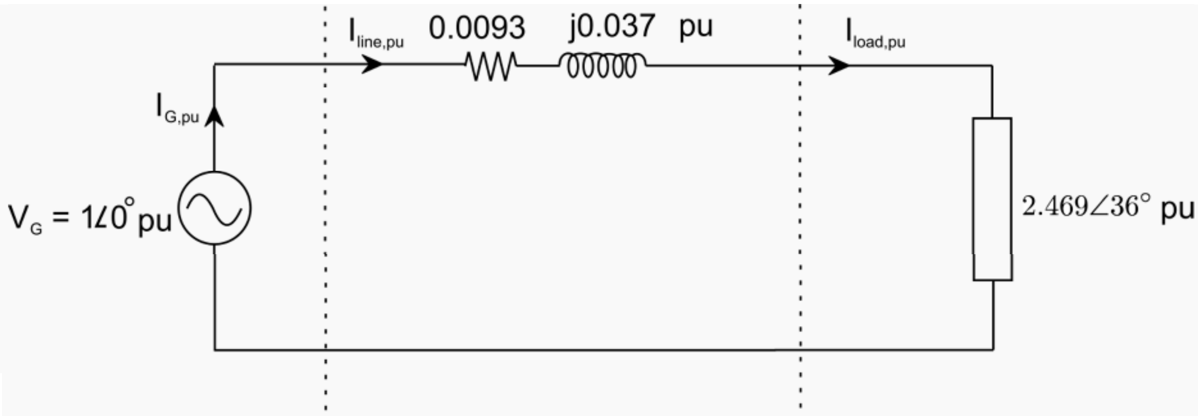
I line,pu
0.093pu
j0.37 pu
I load,pu
I G,pu
V G = 1∠0° pu
24.69∠36° pu



I line,pu
0.93 pu
j0.37 pu
I load,pu
I G,pu
V G = 2∠0° pu
24.69∠36° pu



I line,pu
1.2 pu
4.8 pu
I load,pu
I G,pu
V G = 1∠0° pu
0.8∠36° pu



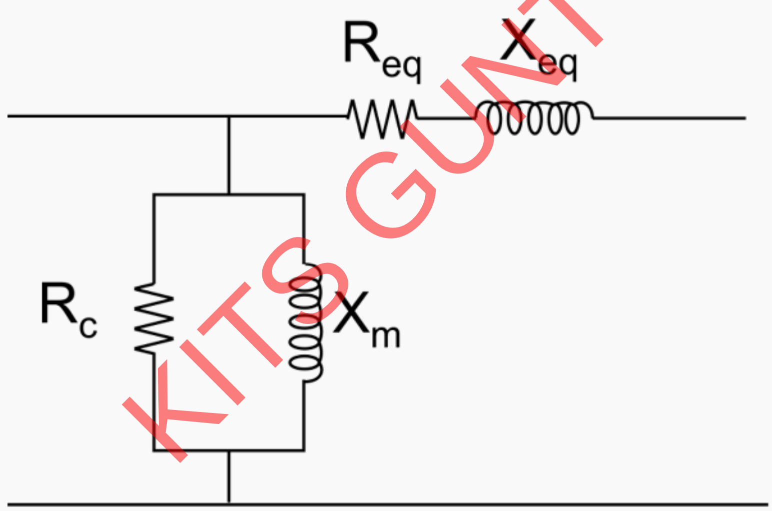
10 points

The open-circuit test and the short circuit test were performed on the primary side of a 10 kVA, 2000/240 V, 50 Hz transformer, and the following data were obtained:

OC Test: Voc : 240V; Ioc = 0.6A; Poc = 80W

SC Test: Vsc : 112V; Isc = 5A, Psc = 160W

Find the approximate equivalent circuit referred to the primary side?

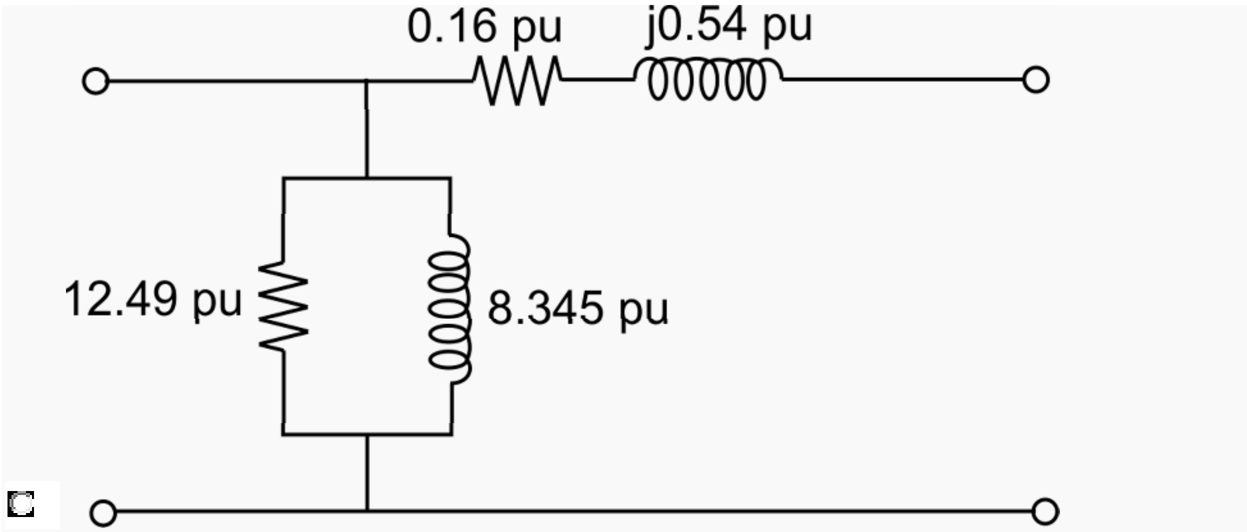


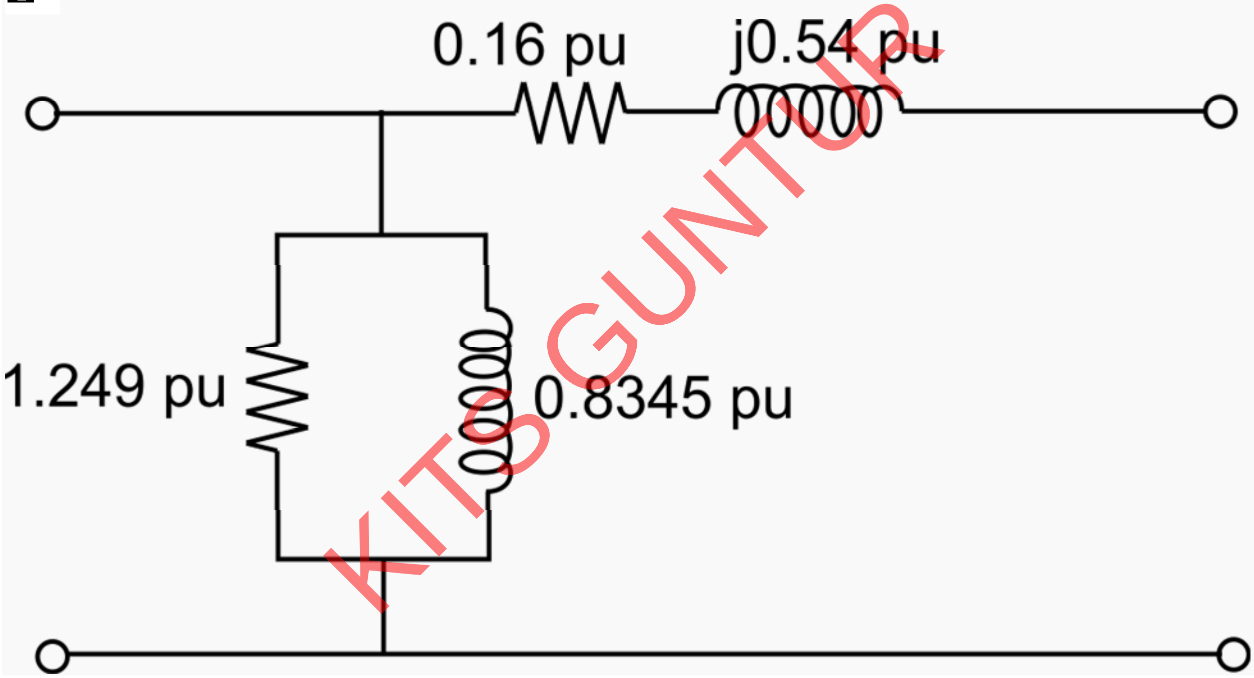
Approximate equivalent circuit referred to primary side

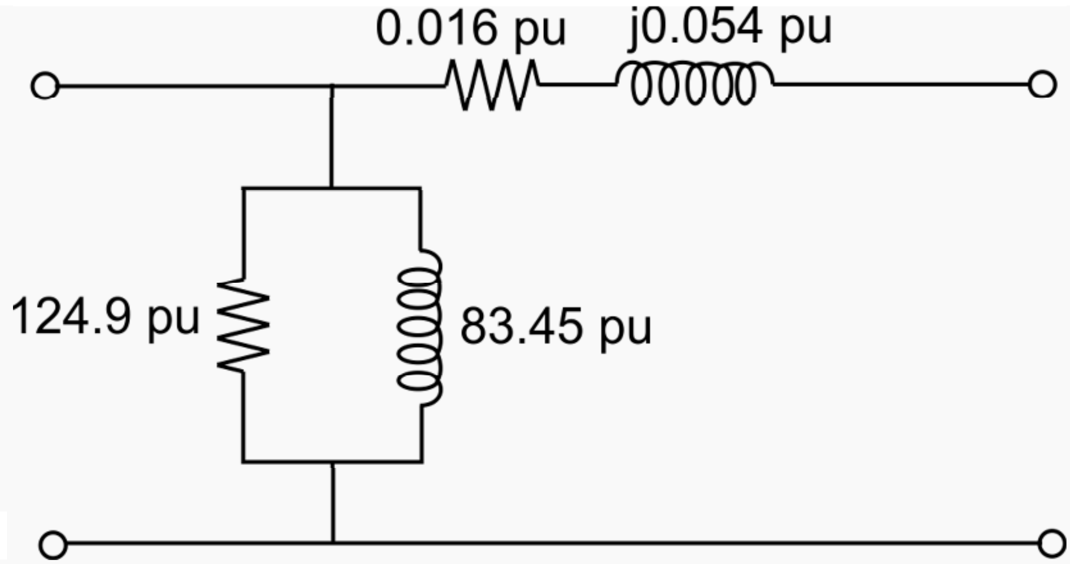
- Req = 6.4Ω ; Xeq = j21.46Ω ; Rc = 49.96kΩ ; Xm = j33.34 kΩ
- Req = 6.4Ω ; Xeq = j21.46Ω ; Rc = 720Ω ; Xm = j480Ω
- Req = 0.092Ω ; Xeq = j0.31Ω ; Rc = 720Ω ; Xm = j480Ω
- Req = 0.092Ω ; Xeq = j0.31Ω ; Rc = 49.96kΩ ; Xm = j33.34 kΩ

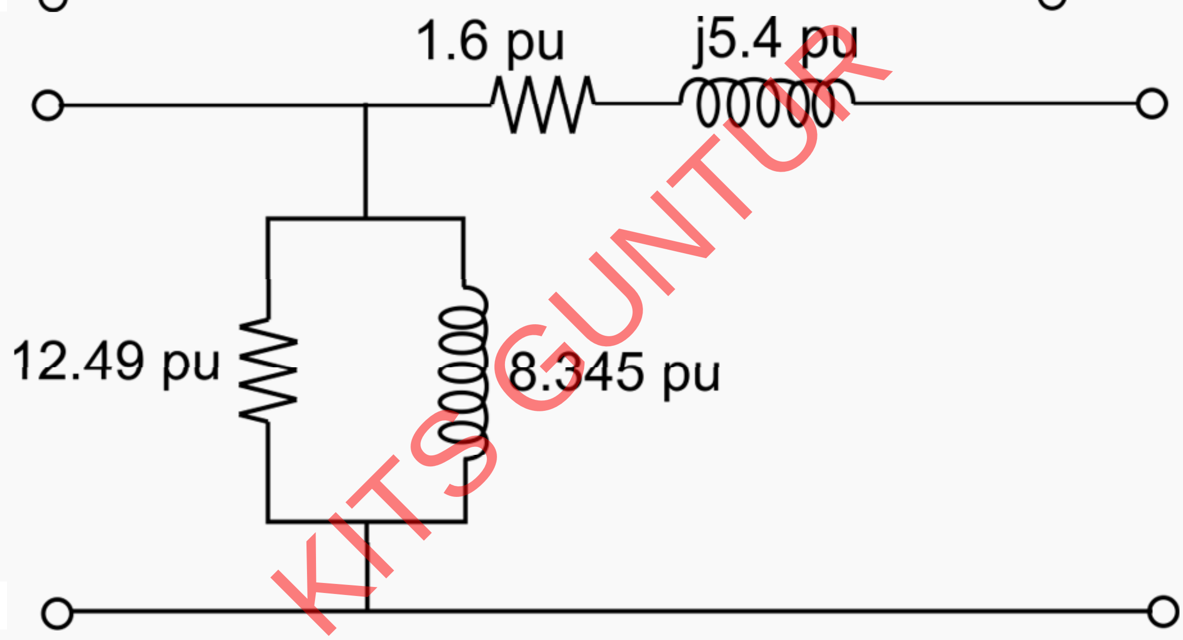
10 points

Find the approximate per-unit equivalent circuit for the transformer in problem-4,using transformer's ratings as the system base.


0.16 pu
j0.54 pu
12.49 pu
8.345 pu


0.16 pu
j0.54 pu
1.249 pu
0.8345 pu





The following data were obtained on a 10kVA,50Hz,1000/100V transformer.

OC test with HV open-circuited : 100V, 2A, 60W

SC test with LV short-circuited : 60V, 10A, 280W

Calculate the efficiency in percentage if the LV side is loaded full at 0.8 power factor.

10 points

The results of tests on a 9.6kVA, 2400/240V transformer is given below

Open-circuit test: 240V, 0.6A, 50W

Short-circuit test: 50V, 3A, 47W

Calculate the efficiency of the transformer in percentage at full load and 0.8 pf lag.

10 points

A transformer has maximum efficiency of 0.983 at 12kVA at unity power factor. The loading through the day is as follows:

10 hours- 3kW at pf of 0.8

6 hours- 10kW at pf of 0.9

6 hours- 15kW at pf of 0.9

Calculate the all-day efficiency in percentage.

10 points

Back-to-back test was conducted on two similar transformers of 200kVA. The wattmeter connected to the supply drew 4kW. Rated current was made to flow in both primary and secondary by applying a small voltage across the secondary. The reading of the watt meter read 6kW. What is the efficiency in percentage of both transformers at full load and upf?

10 points

For a 20kVA, 2000/200V transformer, the iron and copper losses at full load are 300W and 350W respectively. Calculate the maximum efficiency in percentage.

10 points

You may submit any number of times before the due date. The final submission will be considered for grading.