

الماده: تطبيقات في الريدس الكهربيه (ك)

الفرقه: الثانيه

التاريخ: ٢٠١٣-٥-٢٨

الزمن: ٣ Hr

Try all questions

**Q1**

**١٠ Points**

For the following transformer write an algorithm psudo code , draw flowchart and write matlab code to calculate the open and short circuit parameters ( $r_1, r_2, x_1, x_2$ )?

Run the test one time regarding primary side and the other test is regarding secondary side?

Assume any missing data or anything you find it helpful in solving the problem.

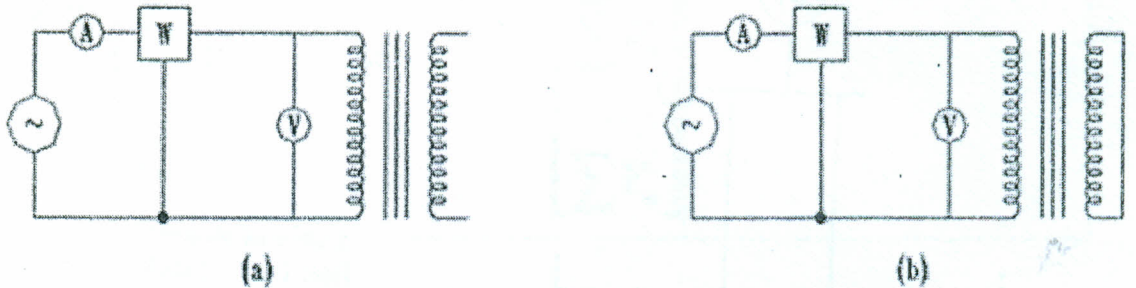


Figure 3 (a) Instrumentation for open-circuit test. (b) Instrumentation for short-circuit test.

**Q2**

**١٠ Points**

write an algorithm, psudo code, draw flowchart and write matlab code to calculate the per-unit values of the following single-line diagram Figure ٢ and draw the impedance diagram.

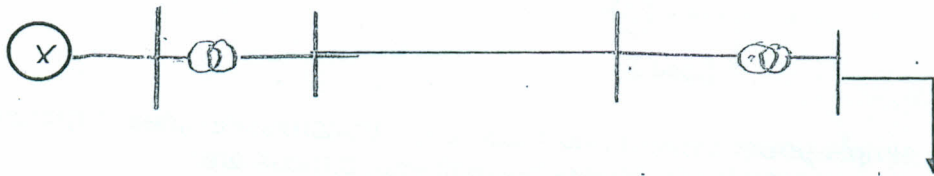


Figure (٢) single-line diagram

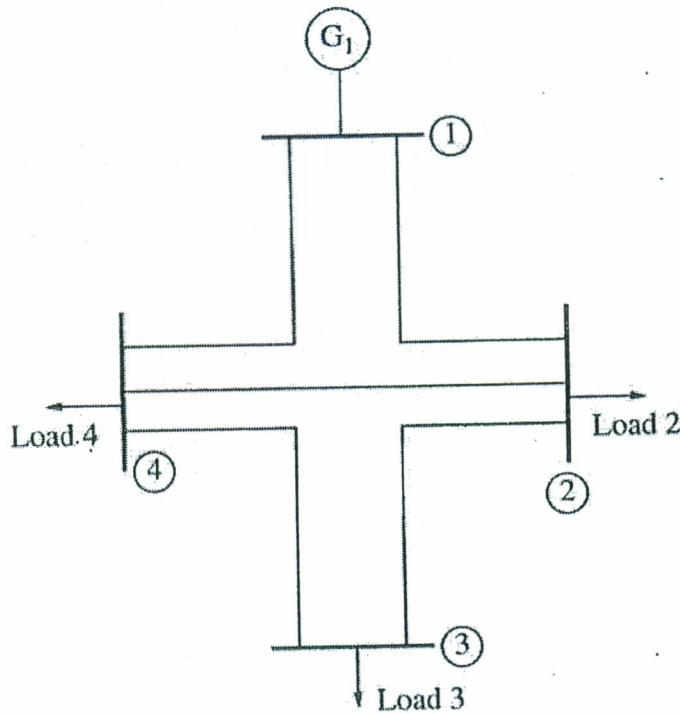
Q7

10 Points

Write an algorithm pseudo code, draw flowchart and write matlab code to calculate Y Matrix given figure 7, figure 8?

$$Y = \begin{bmatrix} Y_{11} & Y_{12} & \dots & Y_{1n} \\ Y_{21} & Y_{22} & \dots & Y_{2n} \\ \dots & \dots & \dots & \dots \\ Y_{n1} & Y_{n2} & \dots & Y_{nn} \end{bmatrix}$$

Figure 7



**Table of Buses:**

Bus 1	Slack bus
Bus 2	Load bus
Bus 3	Load bus
Bus 4	Load bus

Figure 8 a simple power system has 4 busses, 3 transmission lines, 1 generator, and 3 loads. Series per-unit impedances are:

$[Z][I] = [V]$  where	$Z = \begin{bmatrix} Z_{11} & Z_{12} & Z_{13} & \dots & Z_{1n} \\ Z_{21} & Z_{22} & Z_{23} & \dots & Z_{2n} \\ Z_{31} & Z_{32} & Z_{33} & \dots & Z_{3n} \\ \dots & \dots & \dots & \dots & \dots \\ Z_{n1} & Z_{n2} & Z_{n3} & \dots & Z_{nn} \end{bmatrix}$	
$I = \begin{bmatrix} I_1 \\ I_2 \\ I_3 \\ \cdot \\ I_n \end{bmatrix}$	and  $V = \begin{bmatrix} \sum V_1 \\ \sum V_2 \\ \sum V_3 \\ \dots \\ \sum V_n \end{bmatrix}$	$[I] = [Z]^{-1}[V]$

Figure 7

2. Select a slack bus: one of the buses in the power system, whose voltage will arbitrarily be assumed as  $1.0 \angle 0^\circ$ .
3. Select initial estimates for all bus voltages: usually, the voltage at every load bus assumed as  $1.0 \angle 0^\circ$  (flat start) lead to good convergence.
4. Write voltage equations for every other bus in the system. The generic form is
  - o. Calculate an updated estimate of the voltage at each load bus in succession using  $(1), (2), (3)$  except for the slack bus.
  6. Compare the differences between the old and new voltage estimates: if the differences are less than some specified tolerance for all busses, stop. Otherwise, repeat step o.
  7. Confirm that the resulting solution is reasonable: a valid solution typically has bus voltages, whose phases range in less than  $40^\circ$ .

Write the Gauss-Siedel algorithm, psudo code, draw flowchart and write the matlab code?

Q<sup>o</sup>

10 Points

Given figure o and figure 6 write psudo code, draw flowchart and write matlab code to calculate the branch currents (current matrix) for every impedance in the circuit given the circuit in figure o and a punch of formulas in figure 6 below, also assume any missing information you find it helpful to solve the problem?

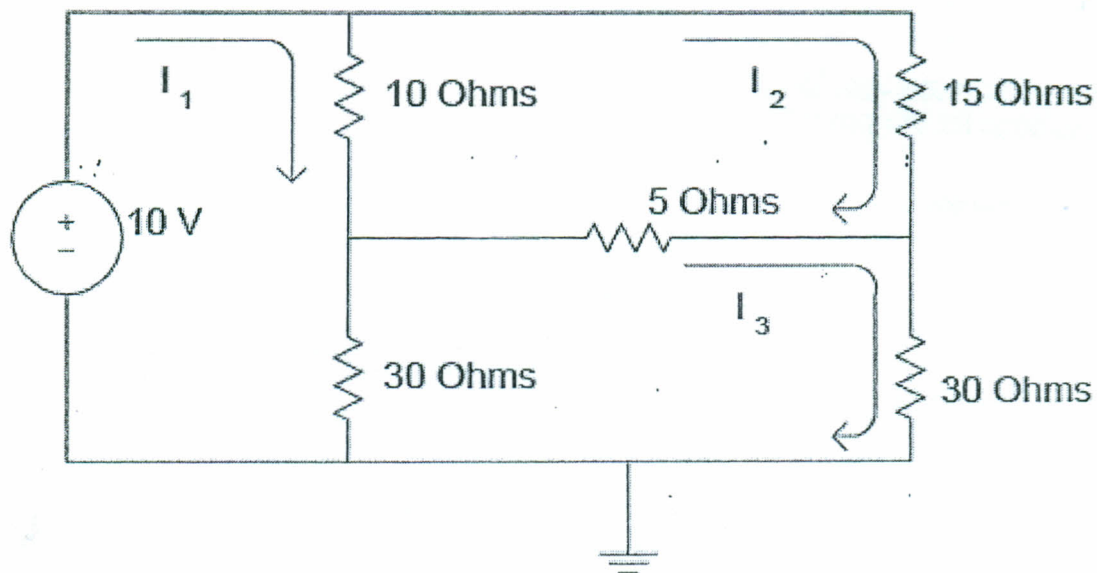


Figure o

line #	Bus to bus	Series Z (pu)	Series Y (pu)
1	1-2	$0,1+j0,4$	$0,08872-j2,3029$
2	2-3	$0,1+j0,0$	$0,3846-j1,9231$
3	2-4	$0,1+j0,4$	$0,08872-j2,3029$
4	3-4	$0,0+j0,2$	$1,1760-j4,7009$
5	4-1	$0,0+j0,2$	$1,1760-j4,7009$

Q4

10 Points

The basic equation for power-flow analysis is derived from the nodal analysis equations for the power system:

$$Y = \begin{bmatrix} Y_{11} & Y_{12} & \dots & Y_{1n} \\ Y_{21} & Y_{22} & \dots & Y_{2n} \\ \dots & \dots & \dots & \dots \\ Y_{n1} & Y_{n2} & \dots & Y_{nn} \end{bmatrix}$$

$$Y_{bus} V = I$$

This method is known as the Gauss-Siedel iterative method. Its basic procedure is :

1. Calculate the bus admittance matrix  $Y_{bus}$  including the admittances of all transmission lines, transformers, etc., between busses but exclude the admittances of the loads or generators themselves.