# KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

## ELECTRICAL ENGINEERING DEPARTMENT

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**EE-463 -161**

## Key Solutions

Quiz 1 ser#: I.D.: Name:

Q.1 A 40-MVA, 400-kV/20-kV, single-phase transformer has the following series impedances: 0.9 + *j*1.8 Ohm (referred to the low-voltage side) and 40 + *j*80 Ohm (referred to the high-voltage side). Using the transformer rating as base, determine the per unit equivalent impedance of the transformer referred to the low-voltage side.

a. 400 + j 800
b. 4.0 + j 8.0
c. 1.0 + j 2.0
**d. 0.10 + j 0.20**

Q.2 A 40-MVA, 400-kV/20-kV, single-phase transformer has the following series impedances: 0.9 + *j*1.8 Ohm (referred to the low-voltage side) and 40 + *j*80 Ohm (referred to the high-voltage side). Using the transformer rating as base, determine the per unit equivalent impedance of the transformer referred to the high-voltage side.

a. 400 + j 800
b. 4.0 + j 8.0
c. 1.0 + j 2.0
**d. 0.10 + j 0.20**

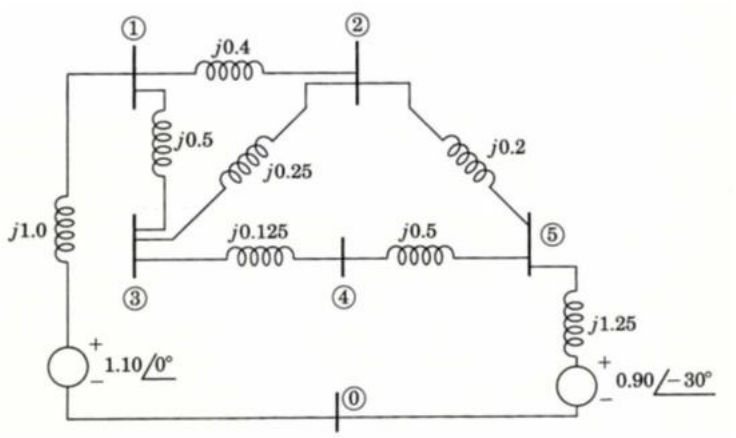
Q.3 A 40-MVA, 400-kV/20-kV, single-phase transformer has the following series impedances: 0.9 + *j*1.8 Ohm (referred to the low-voltage side) and 40 + *j*80 Ohm (referred to the high-voltage side). Using the transformer voltage ratio as the voltage base, and 400-MVA as the MVA base; determine the per unit equivalent impedance of the transformer referred to the low-voltage side.

a. 400 + j 800
b. 4.0 + j 8.0
**c. 1.0 + j 2.0**
d. 0.10 + j 0.20

Q.4 A 40-MVA, 400-kV/20-kV, single-phase transformer has the following series impedances: 0.9 + *j*1.8 Ohm (referred to the low-voltage side) and 40 + *j*80 Ohm (referred to the high-voltage side). Using the transformer voltage ratio as the voltage base, and 400-MVA as the MVA base; determine the per unit equivalent impedance of the transformer referred to the high-voltage side.

a. 400 + j 800
b. 4.0 + j 8.0
**c. 1.0 + j 2.0**
d. 0.10 + j 0.20

Q5. The $Y_{bus}$ for the following network is




**a.** **Ybus = j**

| | | | | | |
|---|---|---|---|---|---|
| **-5.5** | **2.5** | **2.0** | **0.0** | **0.0** |
| **2.5** | **-11.5** | **4.0** | **0.0** | **5.0** |
| **2.0** | **4.0** | **-14.0** | **8.0** | **0.0** |
| **0.0** | **0.0** | **8.0** | **-10.0** | **2.0** |
| **0.0** | **5.0** | **0.0** | **2.0** | **-7.8** |

b. Ybus = - j

| | | | | |
|---|---|---|---|---|
| -5.5 | 2.5 | 2.0 | 0.0 | 0.0 |
| 2.5 | -11.5 | 4.0 | 0.0 | 5.0 |
| 2.0 | 4.0 | -14.0 | 8.0 | 0.0 |
| 0.0 | 0.0 | 8.0 | -10.0 | 2.0 |
| 0.0 | 5.0 | 0.0 | 2.0 | -7.8 |

c. Ybus = j

| | | | | |
|---|---|---|---|---|
| -1.900 | 0.400 | 0.500 | 0.000 | 0.000 |
| 2.500 | -0.850 | 0.250 | 0.000 | 0.200 |
| 0.500 | 0.250 | -0.875 | 0.125 | 0.000 |
| 0.000 | 0.000 | 0.125 | -0.625 | 0.500 |
| 0.000 | 0.200 | 0.000 | 0.500 | -1.950 |

d. Ybus = - j

| | | | | |
|---|---|---|---|---|
| -1.900 | 0.400 | 0.500 | 0.000 | 0.000 |
| 2.500 | -0.850 | 0.250 | 0.000 | 0.200 |
| 0.500 | 0.250 | -0.875 | 0.125 | 0.000 |
| 0.000 | 0.000 | 0.125 | -0.625 | 0.500 |
| 0.000 | 0.200 | 0.000 | 0.500 | -1.950 |