

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

ELECTRICAL ENGINEERING DEPARTMENT

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EE 465 (Semester 162)

Design Project Part-I

A single-phase lossless overhead line with characteristic impedance $Z_A = 400\text{-}\Omega$, velocity of propagation $v_A = 3 \times 10^8$ m/s, and length $l_A = 30$ km is connected to two single-phase lossless cables. The first cable has characteristic impedance $Z_B = 200\text{-}\Omega$, velocity of propagation $v_B = 2 \times 10^8$ m/s, and length $l_B = 20$ km. The second cable has characteristic impedance $Z_C = 100\text{-}\Omega$, velocity of propagation $v_C = 1 \times 10^8$ m/s, and length $l_C = 10$ km. At the sending-end of line A, $e_s(t) = E u(t)$, and $Z_G = 2.Y Z_A$. At the receiving-end of line B, $Z_{RB} = Z_B$. At the receiving-end of line C, $Z_{RC} = 2.Y Z_C$. Assume that all lines are initially un-energized.

- Determine the sending-end, receiving-end reflection coefficients, and all other necessary reflection and refraction coefficients.
- Calculate the transient time of all lines.
- Draw the voltage Bewley lattice diagram for t between 0 and 0.7 msec.
- Plot the voltage at point X versus time for t between 0 and 0.7 msec.

Show all the steps in your calculation, and use proper plot sheets with proper color for parts c and d.

Note:

"X" is center of line A (for the first 5 students).

"X" is center of line B (for the second 5 students).

"X" is center of line C (for the remaining students).

"Y" is 0.your two-digit serial number.

Design Project Part-II

Suspension insulators are used in the transmission and distribution system to provide electrical separation, between high voltage and ground structure, and support the mechanical load of power lines. The requirement of the breakdown voltage-time for insulators depends on the

- Rated phase to ground voltage
- Degree of atmospheric pollution

Some of the typical breakdown voltage-time for insulators based on the level of pollution are tabulated below.

Line	Degree of Pollution	Breakdown Voltage (pu) / Time (msec)
A	Clean areas	0.3 / 0.35
B	Industrial areas	0.12 / 0.5
C	Heavily polluted areas	0.10 / 0.65

Find out if the above insulator will withstand the transient voltage of your case.

Date Due: May 15th, 2017.