SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade (3rd Cycle)
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

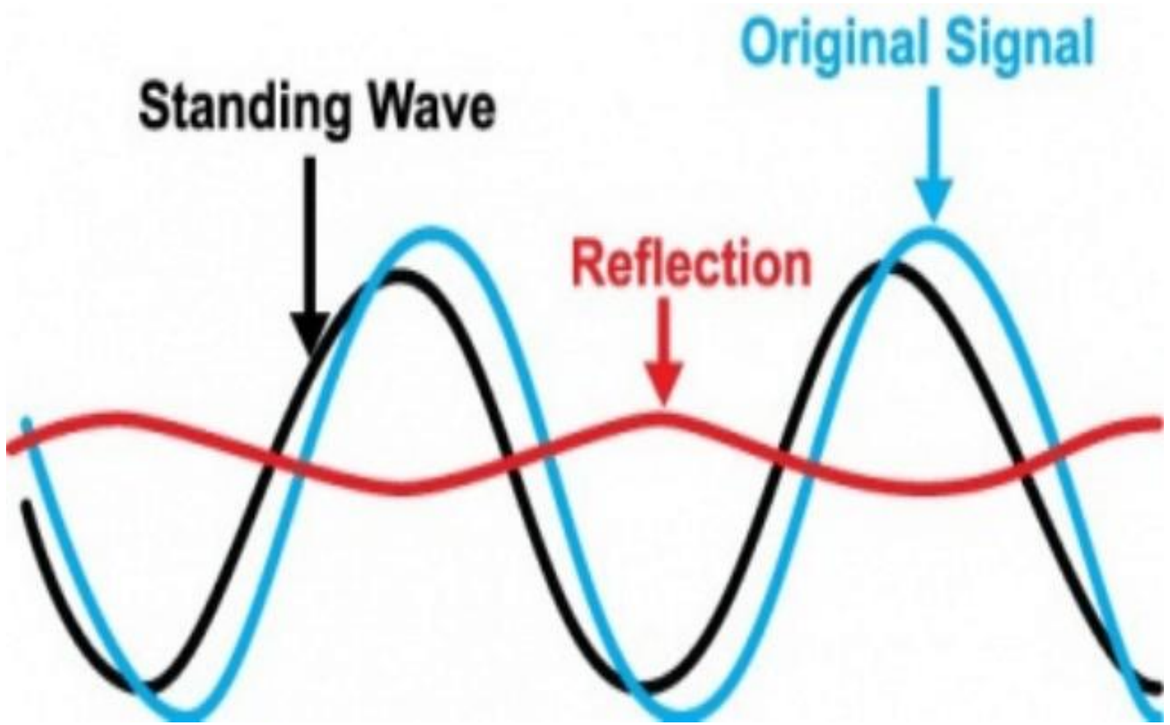
19ECT302 – TRANSMISSION LINES AND ANTENNAS

III YEAR/ V SEMESTER

UNIT 1 – TRANSMISSION LINE THEORY

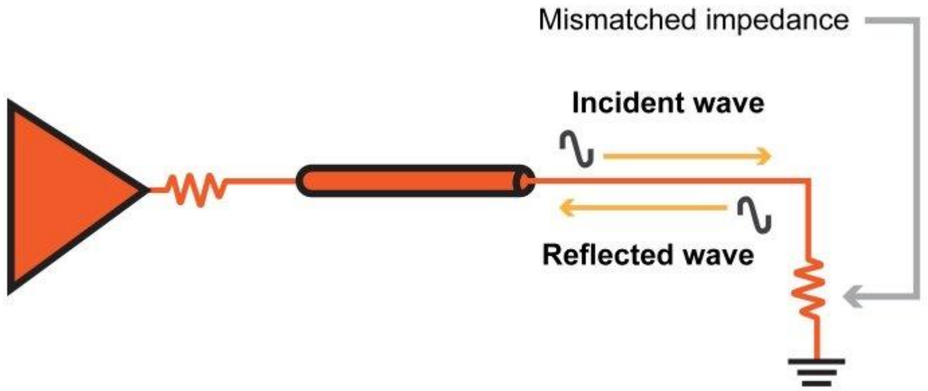
TOPIC – IMPEDANCE MATCHING - QUARTER WAVE TRANSFORMER

WHAT DO YOU INFER FROM THE DIAGRAM ?



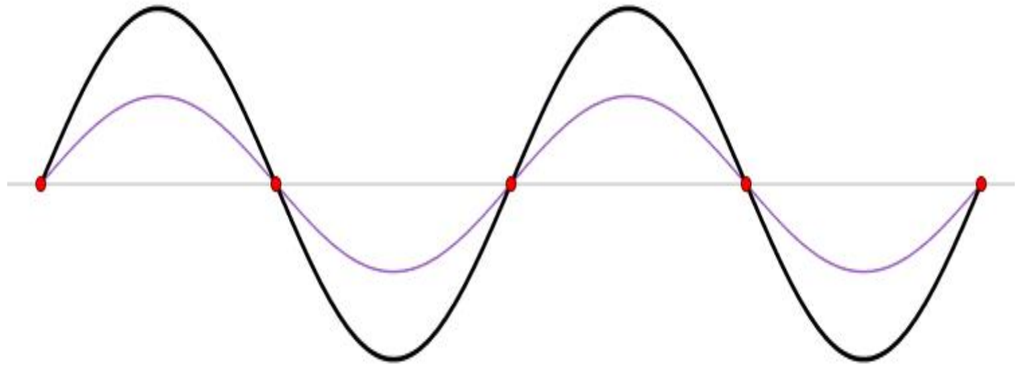
IMPEDANCE MISMATCH AND EFFECTS

- Load impedance is not matched with the characteristic impedance of the transmission line, reflections occur
- This allows the load to absorb the wave energy resulting in power loss



IMPEDANCE MISMATCH AND EFFECTS

- Reflections are problematic because they reduce the amount of power that can be transferred from source to load
- Reflections also lead to standing waves
- The high-amplitude portions of a standing wave can damage components or cables

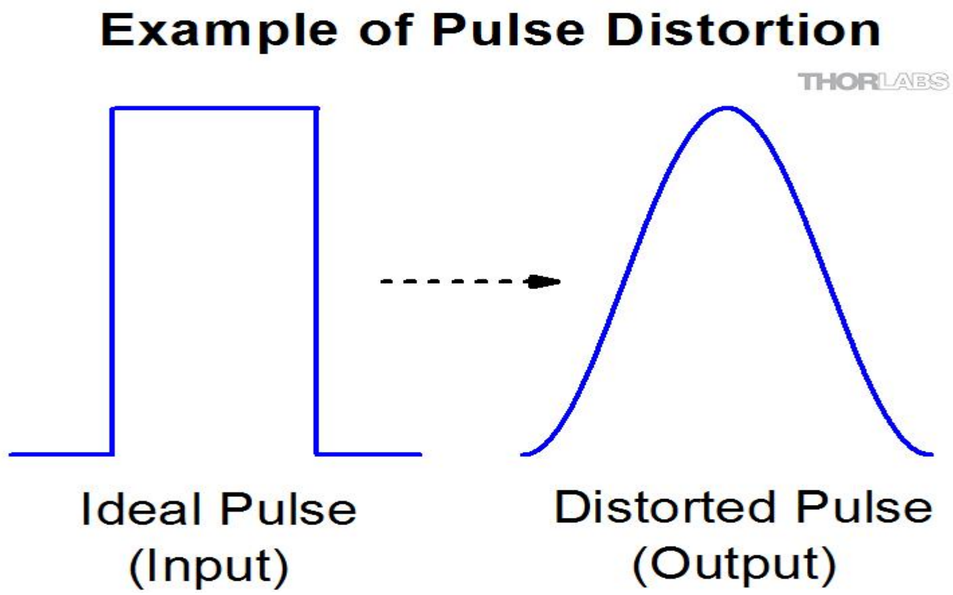


IMPEDANCE MISMATCH AND EFFECTS

- In applications like TV picture transmission, reflection make impairment of picture quality due to ghost images.

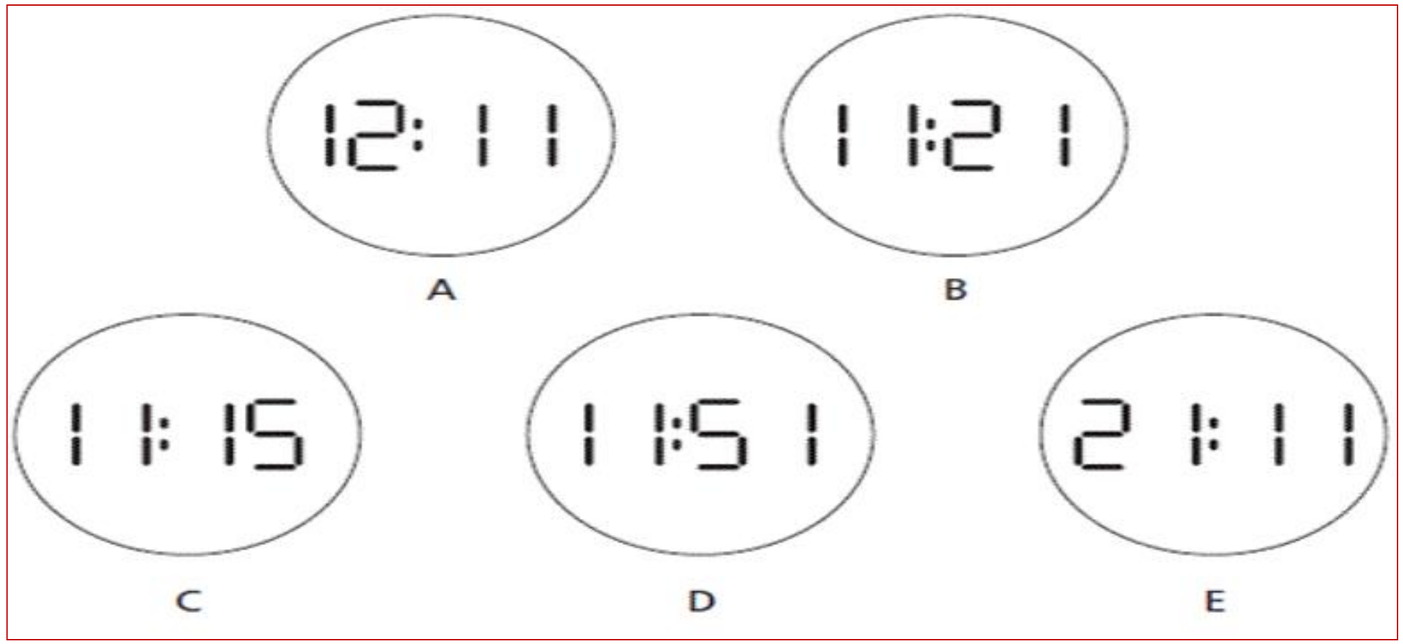
IMPEDANCE MISMATCH AND EFFECTS

- In applications like transmission of pulses, pulse shape distortion occurs
- Problem of frequency stability
- Signal strength get reduced which reduces signal-to-noise ratio



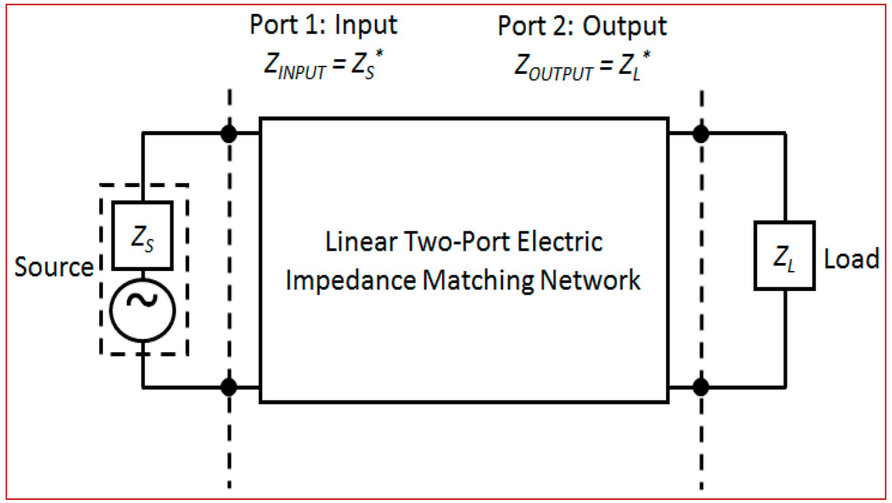
ACTIVITY

Which of the clock first faces is the odd on out ?



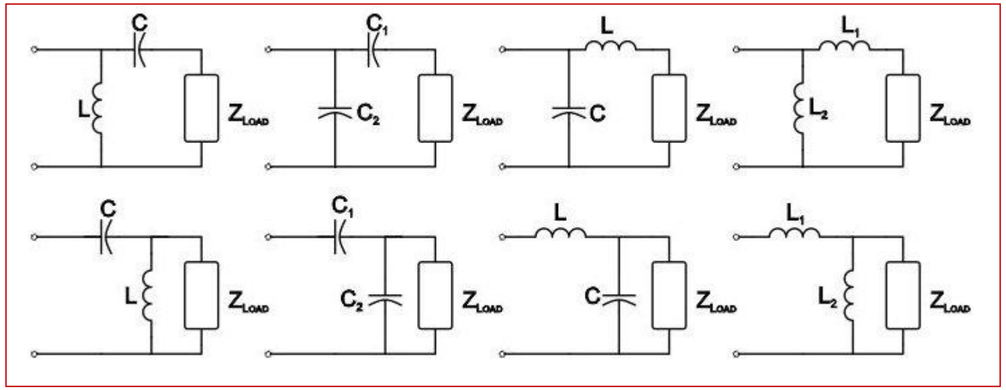
IMPEDANCE MATCHING NETWORKS

- Impedance matching networks are impedance transformers
- They transform the load impedance to the characteristic impedance of the line or
- To transform the line impedance to equal source impedance to provide impedance matching



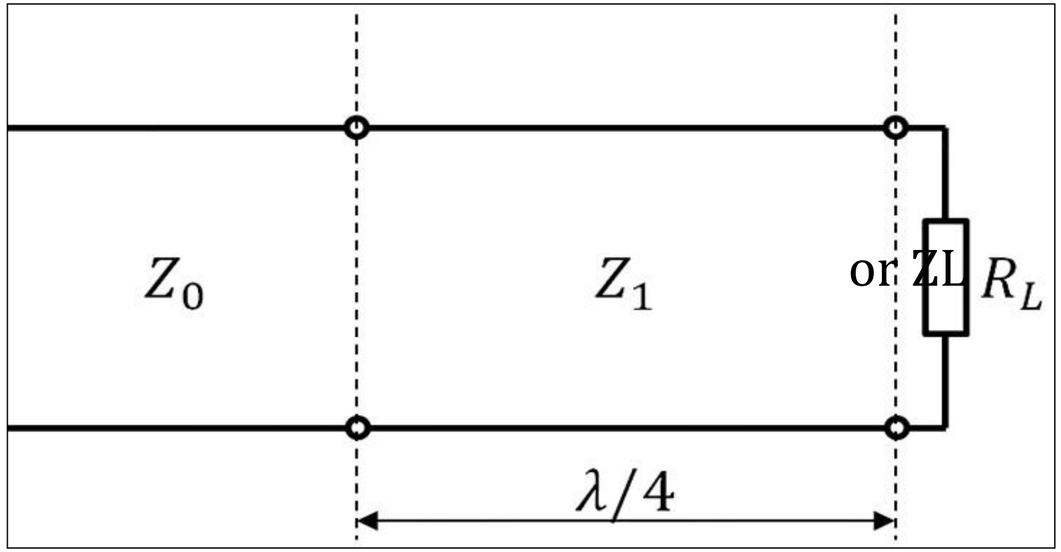
IMPEDANCE MATCHING NETWORKS - TYPES

- Using inductance or capacitance and a section of transmission line
- Using L-C combination
- Using quarter wave transformers
- Using half wave line and eighth wave lines
- Using short circuited stubs



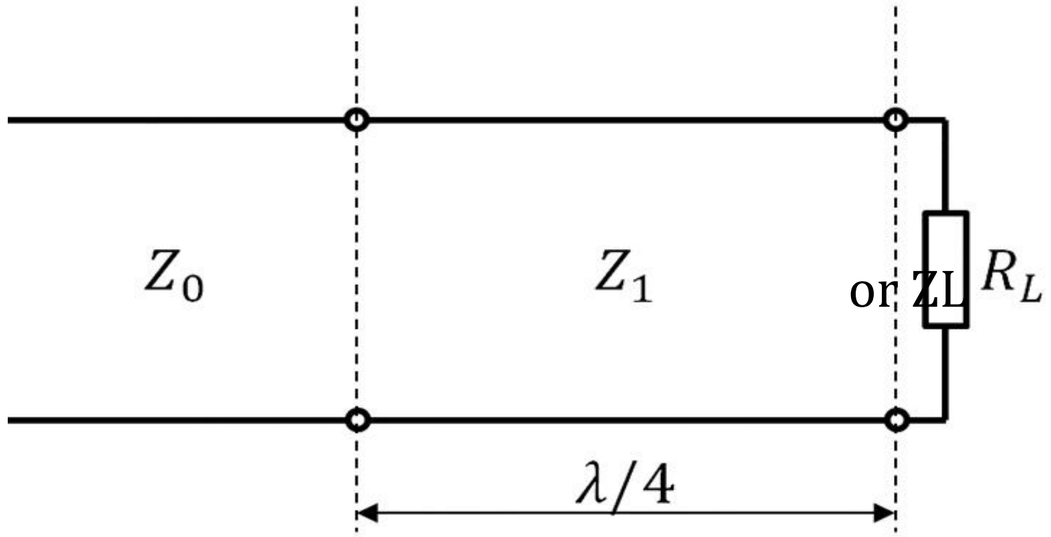
IMPEDANCE MATCHING NETWORKS – QUARTER WAVE TRANSFORMER

- Fig shows a lossless transmission line with characteristic impedance Z connected to load ZL
- Since $Z_0 \neq ZL$, a quarter wave transformer is inserted for impedance matching.
- Length of quarter wave transformer is $\lambda/4$
- Input impedance of the transformer is $Zs = R_0^2/Z_R$



QUARTER WAVE TRANSFORMER - APPLICATIONS

- Used as a transformer
- Used as an impedance inverter
- Used to couple a transmission line to a resistive load
- Used if the load is not pure resistance
- Used as an insulator



ASSESSMENT

1. Design a quarter wave transformer to match a load of 200 Ohms to a source resistance of 500 Ohms. Operating frequency is 200 MHz
2. What are the effects of impedance mismatch?

REFERENCES

1. J.D.Ryder “Networks, Lines and Fields”, PHI, New Delhi, 2003

2. Raju, “Electromagnetic Field Theory and Transmission Lines”, Pearson Education, 2005.

THANK YOU