SUMMARY

- The reflection co-efficient is K = $\frac{Z_R - Z_0}{Z_R + R_0}$
- When the line is terminated in R_0 the standing waves
- Standing Wave ratio S = $\frac{E_{max}}{E_{min}}$

In terms of reflection coefficient S = $\frac{1+|K|}{1-|K|}$ (or) $|K| = \frac{S-1}{S+1}$

- $|K| = \frac{|E_{max}| - |E_{min}|}{|E_{max}| + |E_{min}|}$
- The power equation of P = $|I_{max}| - |EI_{min}|R_0$ (or) $\frac{E2_{max}}{R_{min}}$
- Quarter wave line Zin = $\frac{R_0^2}{Z_R}$; l = $\lambda/4$
- For a dissipation less line $Z_0 = R_0 = \sqrt{\frac{L}{C}}$ $\omega L >>$ R
- $\gamma = \propto + j\beta$; $\propto = 0$; $\beta = \omega\sqrt{LC}$

Velocity = $\vartheta = \frac{1}{\sqrt{LC}}$

- When the line is open circuited at the receiving end $I_R = 0$

$E_{OC} = E_R \cos\frac{2\pi}{\lambda} S$

$I_{OC} = j\frac{E_R}{R_0}\sin\frac{2\pi}{\lambda} S$

- Nodes are points of Zero voltage and current on the standing wave system.
- Antinodes are points of maximum voltage or current.

PART A

1. **State the assumptions for the analysis of the performance of the radio frequency line.**
   - Due to the skin effect ,the currents are assumed to flow on the surface of the conductor. The internal inductance is zero.
   - The resistance R increases with Ö f while inductance L increases with f . Hence wL>>R.
   - The leakage conductance G is zero
2. **State the expressions for inductance L of a open wire line and coaxial line.**
   - For open wire line ,
     L=9.21*10-7(μ/μr +4ln d/a)=10-7(μr+9.21log d/a) H/m
   - For coaxial line,
     L = 4.60*10-7[log b/a]H/m
3. **State the expressions for the capacitance of a open wire line**
   For open wire line ,
   C=(12.07)/(ln d/a)μμf/m
4. **What is dissipationless line?**
   A line for which the effect of resistance R is completely neglected is called dissipationless line .
5. **What is the nature and value of Z_0 for the dissipation less line?**
   For the dissipation less line, the Z_0 is purley resistive and given by, $Z_0 = R_0 = \sqrt{L/c}$
6. **State the values of** a **and** b **for the dissipation less line.**
   α=0 and β=w √LC

7. What are nodes and antinodes on a line?

The points along the line where magnitude of voltage or current is zero are called nodes while the the points along the lines where magnitude of voltage or current first maximum are called antinodes or loops.

8. What is standing wave ratio?

The ratio of the maximum to minimum magnitudes of voltage or current on a line having standing waves called standing waves ratio.

$$S = \frac{|\text{Emax}|}{|\text{Emin}|} = \frac{|\text{Imax}|}{|\text{Imin}|}$$

9. What is the range of values of standing wave ratio?

The range of values of standing wave ratio is theoretically 1 to infinity.

10. State the relation between standing wave ratio and reflection coefficient.

$$S = \frac{1+|K|}{1-|K|}$$

11. What are standing waves?

If the transmission is not terminated in its characteristic impedance ,then there will be two waves traveling along the line which gives rise to standing waves having fixed maxima and fixed minima.

12. How will you make standing wave measurements on coaxial lines?

For coaxial lines it is necessary to use a length of line in which a longitudinal slot, one half wavelength or more long has been cut. A wire probe is inserted into the air dielectric of the line as a pickup device, a vacuum tube voltmeter or other detector being connected between probe and sheath as an indicator. If the meter provides linear indications, S is readily determined. If the indicator is non linear, corrections must be applied to the readings obtained.

13. Give the input impedance of a dissipation less line.

The input impedance of a dissipation less line is given by,

$$Z_{in} = R_0 \left[\frac{Z_R + jR_0 \tan(\beta_S)}{R_0 + jZ_R \tan(\beta_S)}\right]$$

14. Give the maximum and minimum input impedance of the dissipation less line.

$$R_{max} = \frac{E_{max}}{I_{min}} = R_0 \left[\frac{1 + |K|}{1 - |K|}\right] = SR_0$$

$$Rmin = \frac{E_{min}}{I_{max}} = R_0 \left[\frac{1 - |K|}{1 + |K|}\right] = \frac{R_0}{S}$$

15. Give the input impedance of open and short circuited lines.

$$Z_{sC} = jR_0 \tan\frac{2\pi}{\lambda}s$$

$$Z_{0C} = R_0 \left[\frac{1}{j \tan\beta_s}\right]$$

16. Why the point of voltage minimum is measured rather than voltage maximum?

The point of a voltage minimum is measured rather than a voltage maximum because it is usually possible to determine the exact point of minimum voltage with greater accuracy.