Assignment-1

1. What are the advantages and applications of microwaves?

2. Derive and explain voltage and current relationship of a transmission line with lumped element circuit.

3. Define and explain characteristic impedance, reflection coefficient, transmission coefficient, standing wave, and SWR of microwave with equations.

4. Derive and explain the relation between standing wave ratio and reflection coefficient.

5. A telephone line has R=6 Ω/km L=2.2 mH/km C=0.005 μf/km and G=0.05 mho/km. Determine Z_0, α, β at 1 kHz. If the line length is 100 km, determine the attenuation and phase shift of the signal. Calculate phase velocity of the signal.

6. Derive and explain input impedance and admittance of transmission line also find input impedance for S.C. load, O.C. load and for loss less line also find Max. Z and Min. Z of Tx. Line and characteristics of line.

7. The load impedance Z_L=38.8-j48.7 is connected to transmission line of Z_0 =50 , find SWR, maximum and minimum resistance on the line.

8. Draw voltage standing wave pattern for different loads in a loss less line for Z_L =Z_0, Z_L=0, Z_L =∞, Z_L =+jx, Z_L =-jx.

9. A 50 Ω lossless line connects a signal of 100 kHz to a load of 100 Ω. The load power is 100 mW. (i) Calculate Refection coefficient, (ii) VSWR, (iii) Position of first V_{min} and V_{max}, (iv) V_{min} and V_{max} and (v) Impedance at V_{max} and V_{min}.

10. Explain various impedance matching methods in transmission line like Quarter wave transformer, single stub along with equation of location l and length l' of single stub.

11. A dipole antenna whose impedance is a 100 is to be matched at a frequency of 100 MHz with transmission line of Z_0 = 600 by means of short circuited stub. Determine the position and length of stub without smith chart.

12. Using Smith chart, find the SWR on a 150 Ω line when line is terminated in a (225 – j75) Ω impedance. Find nearest point to the load at which quarter-wave transformer may be connected to match this load to the line and calculate the Z_0 of the line from which transformer must be made.

13. For Z_l = 450-j600 at 10 MHz is connected to a 300 transmission line. Calculate the position and length of short circuited stub to match load to line using smith

chart.

14. Explain various losses due to mismatch in transmission line like attenuation loss, reflection loss, transmission loss, return loss and insertion loss.

15. Determine attenuation loss, reflection loss, transmission loss, return loss of lossless transmission line of Z_0 =200 fed by generator of 1 volt and impedance 100 . The line is 300 m long and terminated by load of 300 .

Assignment 2

16. What are TEM, $TE_{m,n,}$ $TM_{m,n}$ modes also sketch field pattern for different modes of $TE_{m,n}$ and $TM_{m,n}$ for m,n of 0,1,2 etc. in rectangular and circular waveguides.

17. Write short note on (i) Rectangular (ii) Circular waveguide.

18. Define and explain phase velocity and group velocity of microwave and relation between with equations.

19. Determine the cutoff wavelength for the dominant mode in rectangular waveguide of b=10 cm. For a 2.5 GHz signal propagated in this waveguide in the dominant mode, calculate the cutoff frequency, guide wavelength, group and phase velocity and characteristic wave impedance in TE_{10} mode.

20. The dominant mode TE_{10} propagating in a rectangular waveguide of dimension a=6cm and b=4 cm. The distance between a maximum and minimum is 4.47 cm. Determine the signal frequency of dominant mode.

21. Explain and derive S matrix for H-plane Tee and E plane Tee also write its applications.

22. Explain Magic Tee with [S] - matrix and also writes its applications.

23. What is the use of waveguide corners bends and twists, explain it?

24. Explain Two hole Directional Coupler also define Coupling factor and Directivity of Directional Coupler.

25. What is Faraday Rotation? Explain Circulator and Isolator with its applications..

26. Determine [S] matrix of 3-port Circulator given insertion loss of 1 dB isolation 30 dB and VSWR of 1.5.

27. An Isolator has an insertion loss of 0.5 dB and isolation of 30 dB. Determine the scattering matrix of the Isolator if the isolated parts are perfectly matched to the junction.

28. A 90 w source is connected to a Directional coupler with C=20 dB, D=35 dB and insertion loss of 0.5 dB. Find output power through coupled and isolated po

29. Explain parallel, coplanar, shielded strip lines.
30. Explain Micro-strip line and enumerate various losses occur in micro-strip.

Assignment 3

31. What is the limitation of conventional tubes at microwave frequencies?
32. Explain two cavity klystron amplifiers.
33. Explain reflex klystron.
34. Explain travelling wave tube (TWT).
35. Write short note on magnetron.
36. Explain following in detail (i) Varactor diode (ii) Step recovery diode (iii)Tunnel diode (iv) PIN diode (v) Gunn diode (vi) Parametric amplifier ((vi) IMPATT, TRAPATT and Schottky barrier diode.
37. Derive radar range equation and explain factors affects maximum range.
38. Write short note on pulsed radar system.
39. Explain A-scope and PPI display and their limitations.
40. Write short note on (i) Duplexer, scanning and tracking radars (ii) CW Doppler radar (iii) Moving target indicator (MTI) radar (iv) Frequency modulated CW radar.
41. Calculate the maximum range of radar system which operates at 3 cm with peak power of 600 KW if its antenna is 5 m^2, minimum detectable signal is 10^{-13} W and radar cross sectional area of the target is 20 m^2.