

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.



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10TE54

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Transmission Lines and Waveguides

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, selecting at least TWO full questions from each part.
2. Use of Smith Chart permitted.

PART – A

- 1 a. With an equivalent circuit of a transmission line, derive the wave equations in terms of V and I. (10 Marks)
b. Design a constant K-lowpass filter to be terminated in 600 ohm, having cut off frequency of 3kHz. Determine: i) The frequency at which the filter attenuation is 17.372 db.
i) Attenuation at 6kHz.
ii) The characteristic impedance and phase constant at 2kHz. (10 Marks)
- 2 a. What is insertion loss? Derive the expression for insertion loss in terms of reflection factors. (08 Marks)
b. Give the theory of quarter wave transformer. What are its applications? (08 Marks)
c. Determine the load impedance Z_R and the standing wave ratio S given that the low loss line has characteristic impedance Z_0 of 500 ohm and that the reflection coefficient $K = 0.4 \angle -50^\circ$. (04 Marks)
- 3 a. Derive the input impedance of open circuited and short circuited line and sketch the variations of the normalized value of reactance with distance. (10 Marks)
b. A dissipation less line is driven with a signal such that the wavelength. $\lambda = 1$ metre. The line is terminated in a impedance of $100 - j 50$ ohm and the voltage across it is $10 \angle 0^\circ$ volt. The characteristic impedance is $Z_0 = 300 \angle 0^\circ$ ohm. Sketch the voltage and current standing wave pattern starting, from load end. (10 Marks)
- 4 a. Discuss the construction and applications of Smith Chart. (06 Marks)
b. What is a stub? Why are short circuited stubs preferred to open circuited one. (04 Marks)
c. A line of $R_0 = 400 \Omega$ is connected to a load of $200 + j300 \Omega$ is excited by a generator at 800MHZ. Determine the length and location of a single stub using Smith Chart of matching. (10 Marks)

PART – B

- 5 a. State the properties of S-parameter prove the symmetry property and unitary property of S-parameter. (10 Marks)
b. Explain the theory of scattering matrix representation of a multipart network. (05 Marks)
c. Obtain the relationship between Z, ABCD, and S-parameters. (05 Marks)

- 6 a. Derive the wave equation for a TM wave and obtain all field components in a rectangular wave guide. (10 Marks)
- b. An air filled rectangular waveguide of inside dimension 7×3.5 cm operates in the dominant mode TE_{10} mode. Find cutoff frequency, phase velocity, guided wavelength of the wave in the guide at a frequency of 3.5 GHz. (05 Marks)
- c. With a neat diagram, explain the operation of resonant isolator. (05 Marks)
- 7 a. With neat sketches, explain the working of a Gunn diode in the Gunn mode and LSA mode. (10 Marks)
- b. With relevant diagram, explain IMPATT diode operation and mechanism of oscillations. (10 Marks)
- 8 Write short notes on the following:
- a. Half wave line of small dissipation (06 Marks)
- b. Parametric amplifiers (08 Marks)
- c. Directional coupler. (06 Marks)

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