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Reg. No.												

Question Paper Code	11806

B.E./B.Tech. - DEGREE EXAMINATIONS, APRIL/MAY 2023

Sixth Semester

Electronics and Communication Engineering

EC8651 – TRANSMISSION LINES AND RF SYSTEMS

(Use of Smith charts is permitted)

(Regulations 2017)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level,CO
1.	What is a distortionless line? What are its constants?	*2,K1,CO1*
2.	Define reflection coefficient.	*2,K1,CO1*
3.	What are the values of SWR for open circuit, short circuit and matched line?	*2,K2,CO2*
4.	Define skin effect.	*2,K1,CO2*
5.	Why short circuit stubs are preferred over open circuit stubs?	*2,K2,CO3*
6.	Find the location of first voltage maxima from the load of a line if the line reflection coefficient is $K=0.47\angle -45°$.	*2,K3,CO3*
7.	Why TEM mode is not possible in waveguide?	*2,K2,CO4*
8.	What is dominant mode? Give the dominant mode of TE and TM waves of rectangular waveguide.	*2,K1,CO4*
9.	What are Mixers? What are its basic characteristics?	*2,K1,CO6*
10.	What is Low noise amplifier? List its applications.	*2,K1,CO6*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	A generator of 1V, 1000 cycles, supplies power to a 100 mile open wire line terminated in 200 ohms resistance. The line parameters are R = 10.4 ohms per mile, L = 0.00367 Henry per mile, G = 0.8×10^{-6} mho per mile, C = 0.00835 μF per mile. Estimate the following parameters; Reflection coefficient, Sending end impedance, Sending end current, Receiving end current, Receiving end voltage, Input power, Power delivered to the load and Efficiency of transmission line.	*13,K3,CO1*

OR

b) Derive the expression for voltage and current at any point on a transmission line in terms of receiving end voltage and current. Also derive it for a line terminated by Z_0. *13,K2,CO1*

12. a) Derive the expression of input impedance of a dissipationless line. Also derive it for open and short circuited lines. *13,K2,CO2*

OR

b) (i) Define standing wave ratio and derive its expression. *6,K2,CO2*

(ii) An antenna as a load on a transmission line produces a standing wave ratio of 2.8 with a voltage minimum 0.12λ from the antenna terminals. Compute impedance at the antenna terminals if Ro = 300 Ω for the line. *7,K3,CO2*

13. a) Derive the expression of location and length of a single stub connected in parallel with the line. *13,K2,CO3*

OR

b) A 50 Ω lossless transmission line is to be matched with a 105 + j40 Ω load using single stub at 30 MHz. Estimate the stub length and its distance from the load using SMITH CHART. *13,K3,CO3*

14. a) Derive the field components of TM waves of a parallel plate waveguide. *13,K2,CO4*

OR

b) Analyze the propagation of TE waves in a rectangular waveguide with necessary expressions for the field components. *13,K2,CO4*

15. a) (i) Discuss the operation of High Electron mobility transistor. *7,K2,CO6*

(ii) What is VCO? Derive the expression of its resonant frequency. *6,K2,CO6*

OR

b) Explain the significance of RF amplifier. Derive the expression of its transducer power gain. *13,K2,CO6*

PART - C (1 × 15 = 15 Marks)

16. a) (i) Derive the TE field components of circular waveguide. *10,K2,CO4*

(ii) A circular waveguide has an internal diameter of 6cm. For a 9 GHz signal propagated in the TE_{11} mode, Compute cut-off frequency and characteristic impedance $[(ha)'_{11} = 1.84]$. *5,K3,CO4*

OR

b) (i) A 30m long lossless transmission line with Zo = 50 Ω operating at 2 MHz is terminated with a load Z_L = 60+j40 Ω. If v= 0.6c on the line, using SMITH CHART evaluate the reflection coefficient, standing wave ratio and input impedance. *10,K3,CO3*

(ii) Explain the significance and applications of Smith chart. *5,K2,CO3*