Q. Code: 455023

Reg. No. | | | | | | | | | | | | | | |

B.E / B.TECH. DEGREE EXAMINATIONS, MAY 2023

Fifth Semester

EC18504 – TRANSMISSION LINES AND WAVEGUIDES

(Electronics and Communication Engineering)

(Use Smith Chart wherever necessary)

(Regulation 2018)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	To give insight about Passive filters.	**2**
CO 2	To introduce the various types of transmission lines and to discuss the losses associated.	**3**
CO 3	To give thorough understanding about high frequency line, power and impedance measurements.	**3**
CO 4	To impart technical knowledge in impedance matching using smith chart.	**3**
CO 5	To impart knowledge on waveguides and cavity resonators.	**3**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Enumerate the merits of Composite filters.	**1**	**2**
2.	Find the characteristic impedance of a symmetrical π network if series arm impedance is 600Ω and shunt arm impedance is 800Ω.	**1**	**3**
3.	How cascaded T sections form a transmission line?	**2**	**3**
4.	Give the significance of Propagation factor.	**2**	**2**
5.	Find L and C of air spaced coaxial line having b/a=10 at 40 Megacycles.	**3**	**3**
6.	Justify that standing waves quantify reflections in a transmission line.	**3**	**3**
7.	What are the applications of Quarter wave line.	**4**	**2**
8.	Give the drawbacks of double stub matching over single stub matching.	**4**	**2**
9.	Discuss the significance of dominant modes for waveguides.	**5**	**3**
10.	Differentiate free space wavelength and guide wavelength.	**5**	**3**

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	Elaborate on the filter fundamentals discussing the significance of characteristic impedance, attenuation and phase shift values in the design of filters.	**(14)**	**1**	**3**

(OR)

		Marks	CO	RBT Level
(b)	Design T and π sections of m-derived HPF having R_o=600Ω,cutoff at 4 KHz and frequency of infinite attenuation is 3.6KHz.	**(14)**	**1**	**3**
12. (a)	The characteristic impedance of a 805 km long line is 94 ∟-23.2 ˚Ω, the value of attenuation constant is 74. X 10^{-6} N and phase shift constant is 174x 10^{-6} rad/m at 5 KHz. Calculate the primary constants and the phase velocity.	**(14)**	**2**	**3**
	(OR)			
(b)	Derive equations for voltage and current on transmission lines in terms of load voltage V_R and load current I_R.	**(14)**	**2**	**3**
13. (a)	Derive expressions of voltages and currents on a transmission line that ensures dissipationless transmission.	**(14)**	**3**	**3**
	(OR)			
(b)	A generator of 1V/1KHz supplies power to a 100km transmission line terminated in 200Ω resistance. The line parameters are R=10Ω/km, L=3.8mH/km, G=1μ℧/km,C=0.0085μF/km. Calculate the input impedance,VSWR,V_{max} ,V_{min} and reflection coefficient.	**(14)**	**3**	**3**
14. (a)	The air-filled two-wire line has a characteristic impedance of 50ohms and is operated at a frequency 3 GHz. The load is Z_L = 100 + j40 ohms. What is the line impedance 2.5 cm from the load? What is the VSWR on the line?Use smith chart.	**(14)**	**4**	**3**
	(OR)			
(b)	Derive an expression of constant r (normalized resistance) and constant x circle (normalized reactance for a lossless transmission line.	**(14)**	**4**	**3**
15. (a)	Justify how a Rectangular Cavity acts as a resonator equivalent to low frequency LC resonant circuit and derive the expression resonant frequency.	**(14)**	**5**	**3**
	(OR)			
(b)	Derive the field configuration, cut off frequency and velocity of propagation for TM waves in rectangular waveguide.	**(14)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Use a single parallel stub tuner to match the line of normalized impedance 0.3+0.5j to its normalized load. Use a shorted stub and find its distance from the load, and its length, using Smith chart.	**(10)**	**4**	**4**

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