Q. Code: 620246

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

B.E./ B.TECH. DEGREE EXAMINATIONS, MAY 2024

Fifth Semester

EC18504 –TRANSMISSION LINES AND WAVEGUIDES

(Electronics and Communication Engineering)

(Regulation 2018 /2018A)

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

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Interpret the filter fundamentals and familiarize with types and techniques of passive filters.	**3**
CO 2	Explain line theory and classify transmission lines and asses distortionless transmissions on lines.	**2**
CO 3	Express transmission lines at high frequency and asses their performance.	**3**
CO 4	Assess performance of lines implementing impedance matching techniques using Smith chart.	**3**
CO 5	Explain waveguides and Cavity Resonators and categories them.	**3**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Summarize the significance of L section in filters.	**1**	**2**
2.	Compare and contrast const K, m-derived and composite filters	**1**	**2**
3.	Intrepet are the secondary constants of a line? Why the line parameters are called distributed elements?	**2**	**2**
4.	Determine the characteristic impedance of a line at 1600 Hz, if the following measurements have been made on line, Z oc =750∠-30 0 Ω and Z sc =600∠-20 0 Ω	**2**	**3**
5.	Relate, what are the assumptions to simply the analysis of line performance at high frequencies?	**3**	**2**
6.	Infer the Standing Wave Ratio if the receiving end impedance is (650-475i) Ω and a low loss line has a characteristic impedance of 400 Ω.	**3**	**1**
7.	What is the use of eighth wave line?	**4**	**1**
8.	What are the difficulties in single stub matching?	**4**	**2**
9.	Which are the non-zero field components for the for the TM11 mode in a rectangular waveguide?	**5**	**1**

			Marks	CO	RBT LEVEL
10.	Can TEM mode is possible in a rectangular waveguide?		**5**	**4**	

PART- B (5 x 14 = 70 Marks)

			Marks	CO	RBT LEVEL
11. (a)	Examine the operation and design of constant K Section Band Pass Filter with necessary equations and diagrams.		**(14)**	**1**	**3**
	(OR)				
(b)	Analyze and explain the design and operation of m-derived T-section LPF filter with necessary equations and diagrams.		**(14)**	**1**	**4**
12. (a)	Develop the transmission lines equation and hence obtain the expression for voltage and current on a transmission line.		**(14)**	**2**	**3**
	(OR)				
(b)	Make use of a generator of 1V ,1000Hz supplies the power to 100 km open wire line terminated in Z0 and having the following parameters. R=10.4 ohm per km G=0.8x10-6 mho per km L=0.00367 henry per km C =0.00835 x10-6 F per km. Calculate Z0, α, β, γ and v. Find the received power.		**(14)**	**2**	**3**
13. (a)	**(i)**	Examine the expression for the input impedance of the dissipation less line.	**(10)**	**3**	**4**
	(ii)	Analyse the above expression finds the input impedance of open and short circuit lines.	**(4)**	**3**	**4**
	(OR)				
(b)	Analyze the line constants, voltage and current on the zero-dissipation line.		**(14)**	**3**	**4**
14. (a)	Develop the input impedances of $\lambda/8$, $\lambda/4$ and $\lambda/2$ line.		**(14)**	**4**	**3**
	(OR)				
(b)	Identify a stub to match a transmission line which is connected to a load impedance of 450-j600 Ω. The characteristic impedance of the line is 300Ω. The operating frequency is 20 MHz.		**(14)**	**4**	**3**
15. (a)	Build an expression for the transmission of TM waves between parallel perfectly conducting planes for the field components.		**(14)**	**5**	**4**
	(OR)				
(b)	Elaborate on the design aspects and working of cavity resonators. Give suitable applications.		**(14)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Examine a TE10 wave of 10 GHz propagates with velocity of $2x10^8$ m/sec.	**(10)**	**5**	**4**

in a brass $\sigma_c = 1.57 \times 10^7$ S/m rectangular waveguide with inner dimensions a=1.5cm and b=0.6 cm which is filled with polyethylene of $\varepsilon_r = 2.25$ and $\mu_r = 1$. Calculate the phase constant, phase velocity, wave impedance. Which signal among the two separate signals with frequency 5 GHz and 15 GHz will be supported by the rectangular waveguide for propagation through it.

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