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

Question Paper Code : 51456

B.E/B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fifth Semester

Electronics and Communication Engineering

EC 2305/EC 55/10144 EC504 – TRANSMISSION LINES AND WAVEGUIDES

(Regulations 2008/2010)

(Common to PTEC 2305 – Transmission Lines and Waveguides for B.E. (Part-Time) Fourth Semester Electronics and Communication Engineering – Regulations 2009)

Time : Three Hours **Maximum : 100 Marks**

(Smith Chart is to be provided)
Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Design a T-type attenuator to operate into a load of 600 Ω with an attenuation of 60 dB.

2. Determine the value of capacitance required for a constant-K II-section low pass filter with a cutoff frequency of 2 kHz. The terminating load resistance is 600 Ω.

3. A lossless transmission line has a shunt capacitance of 100 pF/m and a series inductance of 4 μH/m. Calculate the characteristic impedance.

4. A transmission line has a characteristic impedance of 300 Ω and is terminated in a load of (150 +j 150) Ω. Calculate the reflection coefficient .

5. What is meant by a dissipationless line ?

6. Mention the drawbacks of single stub matching.

7. What are the features of TEM waves ?

8. A wave is propagated in the dominant mode in a parallel plane waveguide. The frequency is 6 GHz and the plane separation is 4 cm. Calculate the cutoff wavelength and the wavelength in the waveguide.

9. An air filled rectangular waveguide has a = 6 cm and b = 4 cm. The signal frequency is 3 GHz. Determine the cutoff frequency for TM_{11} mode.

10. What are the commonly used guide terminations ?

PART – B

Answer ALL questions (5 × 16 = 80 marks)

11. (a) (i) Describe the design and operation of constant-K band pass filter with neat diagrams. **(8)**

(ii) Design a band elimination filter (T-section) with cutoff frequencies of 2 kHz and 6 kHz. The design impedance is 600 Ω. **(6)**

(iii) Compare constant-K and m-derived filters. **(2)**

OR

(b) (i) Explain the principle and operation of crystal filters with necessary diagrams. **(8)**

(ii) Design a symmetrical lattice attenuator to have a characteristic impedance of 600 Ω and attenuation of 20 dB. **(6)**

(iii) Determine the value of 'm' required for an m-derived low pass filter having cutoff frequency of 1000 Hz and resonant frequency of 1100 Hz. **(2)**

12. (a) (i) Derive the transmission line equations and obtain expressions for the voltage and current on a transmission line. **(10)**

(ii) A telephone line has R = 6 Ω/km, L = 2.2 mH/km, C = 0.005 μF/km and G = 0.05×10^{-6} mho/km. Determine the characteristic impedance and propagation constant at 1 kHz. **(6)**

OR

(b) (i) What are the types of waveform distortion introduced by a transmission line ? Derive the conditions for the distortionless operation of a transmission line. **(12)**

(ii) A telephone cable is 64 km long. This cable has R = 13 Ω /km and C = 0.008 μF/km. Calculate the attenuation and phase constants at 1000 Hz and also the velocity of propagation. **(4)**

13. (a) (i) Derive expressions for the input impedance of open and short circuited lines operating at radio frequencies. **(10)**

(ii) A transmission line of 100 m long is terminated in a load of (100-j200) Ω. Determine the line impedance at 25 m from the load end at a frequency of 10 MHz. The characteristic impedance of the line is 100 Ω. Determine the input impedance using Smith chart. **(6)**

OR

(b) (i) Explain the principle and technique of single stub matching with necessary diagrams and expressions. **(10)**

(ii) A 300 Ω transmission line is connected to a load impedance of (450-j600) Ω. Find the position and length of a short circuited stub required to match the line at a frequency of 10 MHz using Smith chart or relevant formula. **(6)**

14. (a) (i) Explain the transmission of TM waves between parallel perfectly conducting planes with necessary expressions for the field components. **(12)**

(ii) Discuss the characteristics of TE and TEM waves between parallel planes. **(4)**

OR

(b) (i) Discuss the transmission of TE waves between parallel perfectly conducting planes with necessary expressions for the field components. **(12)**

(ii) Write a brief note on wave velocities and impedances. **(4)**

15. (a) (i) Describe the propagation of TM waves in a rectangular waveguide with necessary expressions for the field components. **(12)**

(ii) An air filled rectangular waveguide of dimensions a = 7cm and b = 3.5 cm operates in the dominant mode. Find the guide wavelength and phase velocity at a frequency of 3.5 GHz. **(4)**

OR

(b) (i) Discuss the principle of operation and applications of resonant cavities. **(10)**

(ii) Explain the excitation of various modes in rectangular cavities. **(6)**
