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Question Paper Code : X 60453

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Fifth Semester
Electronics and Communication Engineering
EC 2305/EC 55/10144 EC 504 – 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. What is constant K filter ? Why it is called prototype filter section ?
2. A prototype LPF is to be designed which must have R_o = 600 Ω, f_c = 1KHz. Find filter elements [L and C].
3. A 50 Ω coaxial cable feeds a 75 + j20 Ω dipole antenna. Find reflection coefficient and standing wave ratio.
4. At a frequency of 80 MHz, a lossless transmission line has a characteristic impedance of 300 Ω and a wavelength of 2.5 m. Find L and C.
5. A lossless transmission line has a shunt capacitance of 100 pF/m and a series inductance of 4 μH/m. Determine the characteristic impedance.
6. Write the conditions to be satisfied by a dissipationless line.
7. What is degenerate mode in rectangular waveguide ?
8. State the characteristics of TEM waves.
9. A rectangular waveguide has the following dimensions l = 2.54 cm, b = 1.27 cm and thickness = 0.127 cm. Calculate the cut-off frequency for TE_{11} mode.
10. What are the dominant mode and degenerate modes in rectangular waveguide ?

PART – B **(5×16=80 Marks)**

11. a) i) Explain the operation and design of constant-K T section band elimination filter with necessary equations and diagrams. **(8)**

ii) Design a constant K band pass filter (both T and π-sections) having a design impedance of 600 Ω and cut off frequencies of 1 KHz and 4 KHz. **(8)**

(OR)

b) i) Explain the principle and operation of crystal filters with neat diagrams. Write its applications. **(10)**

ii) Design an m-derived T section low pass filter having cutoff frequency of 1 KHz. Design impedance is 400 Ω and the resonant frequency is 1100 Hz. **(6)**

12. a) i) Obtain the general solution of transmission line. **(10)**

ii) A telephone cable 64 km long has a resistance of 13 Ω /km and a capacitance of 0.008 μF/km. Calculate attenuation constant, velocity and wavelength of the line at 1000 Hz. **(6)**

(OR)

b) i) Explain about different type of transmission line. **(8)**

ii) Discuss the following : reflection loss and return loss. **(8)**

13. a) A 30 m long lossless transmission line with $Z_0 = 50\ \Omega$ operating at 2 MHz is terminated with a load $Z_L = 60 + 40\ j\ \Omega$. If U = 0.6 C on the line, find

i) Reflection coefficient. **(5)**

ii) Standing wave ratio. **(5)**

iii) Input impedance. **(6)**

(OR)

b) Discuss the following :

i) Impedance matching. **(8)**

ii) Single and double stub matching. **(8)**

14. a) Derive the field expressions for transmission of TE waves between Parallel planes.

(OR)

b) Explain the following :

i) Attenuators. **(8)**

ii) Characteristic impedance. **(8)**

15. a) Derive the expression for the field components of TE and TM waves in a circular waveguide. **(16)**

(OR)

b) i) A rectangular cavity resonator excited by TE_{101} mode at 20 GHz has the dimensions a = 2 cm, b = 1 cm. Calculate the length of the cavity. **(8)**

ii) With neat diagrams, explain the concept of excitation of modes. **(8)**

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