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Question Paper Code : 23454

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Fifth Semester

Electronics and Communication Engineering

EC 2305 — TRANSMISSION LINES AND WAVE GUIDES

(Regulations 2008)

(Common to PTEC 2305 — Transmission Lines and Wave Guides for B.E. (Part-Time) Fourth Semester – ECE – Regulations 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define propagation constant in a symmetrical network.
2. What are the major drawbacks of a constant-k prototype filter?
3. What is meant by distortion-less line?
4. Define reflection loss.
5. What are assumptions to simplify the analysis of line performance at high frequencies?
6. Calculate standing wave ratio and reflection co-efficient on a line having the characteristic impedance of 300 Ω and is terminated by a load impedance of (300 + j400) Ω.
7. Define attenuation factor.
8. Mention the characteristic of TEM waves.
9. How is a cavity resonator formed? what are its different types?
10. Justify, why TM_{01} and TM_{10} modes in a rectangular wave-guide does not exist.

PART B — (5 × 16 = 80 marks)

11. (a) What is m derived filter? Draw a m-derived T section and π section low pass filter and explain the analysis of m derived low pass filter with respect to attenuation, phase shift and characteristic impedance with frequency profile respectively. (16)

Or

(b) Design a low pass composite filter to meet the following specifications f_c = 2000 Hz, f_∞ = 2050 Hz, R_k = 500 Ω. (16)

12. (a) (i) Explain in detail about the reflection on a line not terminated by its characteristic impedance Z_0. (8)

(ii) Derive the condition for minimum attenuation in a distortion-less line. (8)

Or

(b) A generator of 1 V, 1 KHz supplies power to a 100 km open wire line terminated in 200 Ω resistance. The line parameter are R = 10 Ω/km, L = 3.8mH/km, C = .0085 μF /km and G = 1×10^{-6} mho/km. Calculate $Z_0, \alpha, \beta, \lambda, v$. Also find the received power. (16)

13. (a) (i) Derive the line constants of a zero dissipation-less line. (8)

(ii) A line with zero dissipation has R = 0.006 Ω/m, C = 4.45pF/m, L = 2.5 μH/m. If the line is operated at 10MHz. Find $R_0, \alpha, \beta, \lambda, v$. (8)

Or

(b) (i) Derive an expression for the input impedance of a distortion less line. And also find the input impedance is maximum and minimum at a distance 's'. (8)

(ii) Find the sending end line impedance for a HF line having characteristic impedance of 50 Ω. The line is length (1.185 λ) and is terminated in a load of (110 + j 80)Ω. (8)

14. (a) Derive an expression for the transmission of TE waves between parallel planes perfectly conducting planes for the field components. (16)

Or

(b) For a frequency of 10 GHz and plane separation of 5 cm in air, find the cut-off frequency, cut off wavelength, phase velocity and group velocity of the wave. (16)

15. (a) Derive the field component of a transverse electric wave in Rectangular wave guides. (16)

Or

(b) (i) Write a brief note on circular cavity resonator and its application.

(ii) A TE_{11} wave is propagating through a circular wave guide. The diameter of the guide is 10 cm and the guide is air-filled given $X_{11} = 1.842$.

(1) Find the cut-off frequency

(2) Find the wavelength λ_g in the guide for a frequency of 3GHz.

(3) Determine the wave impedance in the guide.
