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Question Paper Code : 91409

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Fifth Semester

Electronics and Communication Engineering

EC 2305/EC 55/10144 EC 504 — TRANSMISSION LINES AND WAVEGUIDES

(Regulation 2008/2010)

(Common to PTEC 2305 – Transmission Lines and Waveguides for B.E. (Part-Time) Fourth Semester Electronics and Communication Engineering – Regulation 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 = 1 KHz. Find filter elements [L and C].

3. Define wavelength of the line.

4. What is the significance of reflection coefficient?

5. List parameters of the open wire line at high frequencies.

6. A line having characteristic impedance of 50Ω is terminated in load impedance (75 + j75) Ω. Determine the reflection coefficient.

7. Why is TEM mode not supported by waveguide?

8. State the significance of dominant mode of propagation.

9. A rectangular waveguide with a 5 cm × 2 cm cross is used to propagate TM_{11} mode at 10 GHz. Determine the cut off wave length.

10. Mention the applications of resonant cavities.

PART B — (5 × 16 = 80 marks)

11. (a) Design a constant K band pass filter derving expressions for the circuit components. A constant K highpass filter cuts off at a frequency of 2300 Hz. The load resistance is 500Ω. Calculate the values of components used in the filter.

Or

(b) Design a composite high pass filter to operate into a load of 600Ω and have a cut off frequency of 1.2 KHz. The filter is to have one constant k section, one m-derived section with $f\infty = 1.1KHz$ and suitably terminationed half section. Discuss the merits and demerits of m-derived filter and crystal filter.

12. (a) Obtain the expression for current and voltage at any point along a line which is terminated in Z_o.

Or

(b) For a transmission line terminated in Z_o, prove that $Z_o = \sqrt{Z_{SC}.Z_{OC}}$. The following measurement are made on a 25 km line at a frequency of 796 Hz. $Z_{SC} = 3220\angle -79.29^\circ\ \Omega, Z_{OC} = 1301\angle 76.67^\circ\ \Omega$. Determine the primary constants of the line.

13. (a) Explain the parameters of open wire line and coaxial cable at RF. Mention the standard assumptions made for radio frequency line.

Or

(b) A line having characteristic impedance of 50Ω is terminated in load impedance [75 + j75] Ω . Determine the reflection coefficient and voltage standard wave ratio. Mention the significance and application of Smith chart.

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

Or

(b) Explain the following :

(i) Attenuators

(ii) Characteristic impedance.

15. (a) A rectangular air filled copper waveguide with a $a = 2.28$ cm and $b = 1.01$ cm cross section and $l = 30.48$ cm is operated at 9.2 GHz with a dominant mode. Find the cut off frequency, guide wavelength, phase velocity and characteristic impedance.

Or

(b) Explain the principles of the following :

(i) Excitation of waveguides.

(ii) Guide termination and resonant Cavities.
