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**Question Paper Code : 57294**

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

**Fifth Semester**

**Electronics and Communication Engineering**

**EC 6503 – TRANSMISSION LINES AND WAVE GUIDES**

**(Regulations 2013)**

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

**(Normalised Smith chart is to be provided)**

**Answer ALL questions.**

**PART – A (10 × 2 = 20 Marks)**

1. What is characteristics impedance ?
2. Define reflection loss.
3. What are the assumptions to simplify the analysis of line performance at high frequencies ?
4. Write the expression for standing wave ratio in terms of reflection co-efficient.
5. Why a quarter wave line is considered as a impedance inverter ? Justify.
6. What is a stub ? Why it is used in between transmission lines ?
7. What are the major draw backs of a constant – k prototype filter ?
8. Why a composite filter is designed and what are the various sections of the composite filter ?
9. Define dominant mode. What is the dominant mode of a rectangular wave guide ?
10. How a cavity resonator is formed ?

## PART – B (5 × 16 = 80 Marks)

11. (a) (i) Derive the transmission line equation and hence obtain expression for voltage and current on a transmission line. **(10)**

(ii) Prove that an infinite line equal to finite line terminated in its characteristic impedance. **(6)**

**OR**

(b) A generator of 1 V, 1000 Hz supplies power to a 100 km open wire line terminated in $Z_0$ and having following parameters

R = 10.4 ohm per km  G = $0.8 \times 10^{-6}$ mho per Km

L = 0.00367 Henry per Km  C = 0.00835 μF per Km

Calculate $Z_0$, α, β, λ, v. Also find the received power. **(16)**

12. (a) (i) Derive the line constants of a zero dissipationless line. **(8)**

(ii) A line with zero dissipation has

R = 0.006 ohm per m  C = 4.45 pF per m

L = 2.5 μH per m

If the line is operated at 10 MHz find Ro α, β, λ, v. **(8)**

**OR**

(b) (i) Discuss in detail about the variation of Input Impedance along open and short circuit lines with relevant graphs. **(10)**

(ii) A loss less line has a Standing Wave ratio of 4. The $R_0$ is 150 ohms and the maximum voltage measured in the line is 135 V. Find the power delivered to the load. **(6)**

13. (a) (i) Prove that the input impedance of a quarter wave line is Zin = $R_0^2/ZR$. **(6)**

(ii) Design a quarter wave transformer to match a load of 200 ohms to a source resistance of 500 ohms. Operating frequency is 200 MHz. **(10)**

**OR**

(b) A load (50 – j 100) ohms is connected across a 50 ohms line. Design a short circuited Stub to provide matching between the two at a signal frequency of 30 MHz using Smith chart. **(16)**

14. (a) (i) Derive the design equations of a constant k low pass filter. **(8)**

(ii) A $\pi$ section filter network consists of a series arm inductance of 20 mH and two shunt capacitor of 0.16 $\mu$F each. Calculate the cut off frequency, attenuation and phase shift at 15 KHz. What is the value of nominal impedance in the pass band ? **(8)**

**OR**

(b) Design a low pass composite filter to meet the following specifications $f_c$ = 2000 Hz, $f_\infty$ = 2050 Hz, $R_k$ = 500 ohms. **(16)**

15. (a) Derive the field component of a Transverse Electric wave in Rectangular wave guides. **(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)**