Reg.No.:								

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu

Question Paper Code: 7015

B.E. / B.Tech. DEGREE SUPPLEMENTARY EXAMINATIONS – FEB. / MAR. 2020
Fifth Semester
Electronics and Communication Engineering
U15EC517 – TRANSMISSION LINES AND WAVEGUIDES
(Regulation 2015)

Time : Three Hours Maximum : 100 Marks

Answer ALL the questions
(Smith chart may be provided)

PART – A

(10 x 2 = 20 Marks)

1. When will a transmission line deliver maximum power to the load?
2. Illustrate the relation between characteristics impedance and propagation constant.
3. Find the VSWR and reflection coefficient on a line having $Z_O = 300\Omega$ and terminating impedance $Z_R = 300 + j400\Omega$.
4. State the input impedance of a half wavelength ($\lambda/4$) line wave transformer.
5. Define phase and group velocities. Give the equation relating them.
6. Write the expression for cutoff wavelength of the wave which is propagated in between two parallel planes.
7. Why the TE_{10} wave is called as dominant mode in rectangular waveguide?
8. Determine the cutoff wavelength of a rectangular waveguide whose dimensions are a = 2.3 cm and b =1.03 cm operating mode.
9. Why TEM mode is not possible in circular waveguide?
10. What are cavity resonator? Write the dominant mode in rectangular cavity resonator.

PART – B

(5 x 13 = 65 Marks)

11. a) Derive the general transmission line equations for voltage and current at any point on a line.

(OR)

b) A transmission line has following constants: R = 10.4 Ω/m, L = 3.66 mH/m, C = 0.00835 μF/m & G = 0.8 μ℧/m. Determine characteristic impedance, attenuation constant, phase constant& phase velocity at ω = 5000 radians sec.

12. a) A 100+ j 200 Ω Load is connected to a 100 Ω lossless line using smith chart solve the following,

i. Reflection coefficient
ii. VSWR
iii. Load Admittance
iv. Input Impedance at 0.4 λ from the load

(OR)

b) A 50 Ω transmission line is connected to a cellular phone antenna with load impedance Z_L = 25- j50 Ω. Find the position and the length of a short-circuit stub to match the 50 Ω line using smith chart.

13. a) Explain the characteristics in parallel planes of perfect conductor.

(OR)

b) For guided waves between two infinite conducting planes separated by a distance of 0.25 m, find cut off frequency for the TM_{20} modes. If the operating frequency is 3GHz, solve phase velocity of the wave.

14. a) Derive the field expression for TM mode in rectangular waveguides with neat diagram.

(OR)

b) Consider the length of Teflon-filled, copper K band rectangular waveguide having dimensions a = 1.07 cm, b = 0.43 cm. Solve cut off frequencies of the first five propagating modes. If the operating frequency is 15 GHz. (Relative permittivity of Teflon is 2.08)

15. a) Derive and explain the TM wave field components in circular waveguide using Bessel function.

(OR)

b) i. With neat diagram, explain the excitation of modes in circular wave guide. (8)

ii. Write the expression for cut-off frequency, cut-off wave length, wave impedance, phase constant for TE modes in circular wave guide. (5)

PART – C

(1 x 15 = 15Marks)

16. a) A lossless transmission line with $Z_O = 50\ \Omega$ and d = 1.5 cm connects a voltage V_g source to a terminal load of $Z_L = 50 + j50\ \Omega$. If $V_g = 60$ V, operating frequency f = 100 MHz and $Z_g = 50\ \Omega$, Solve the distance of the first voltage maximum l_m from the load and what is the power delivered to the load P_L? Assume the speed of the wave along the transmission line equal to speed of light C.

(OR)

b) An air filled resonant cavity with dimensions a = 5 cm, b = 4 cm and c = 10 cm is made of copper ($\sigma_c = 5.8 \times 10^7$ mhos/m). Solve the resonant frequencies of the five lowest order modes and the quality factor TE_{101} mode.