

B.E. / B.Tech (FullTime) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2011
ELECTRONICS AND COMMUNICATION ENGINEERING BRANCH
SIXTH SEMESTER
EC 385 – RF AND MICROWAVE ENGINEERING
(REGULATION 2004)

Time: 3 Hours

Max.marks: 100

Answer ALL Questions

Part-A (10x2=20 Marks)

1. What are the losses in microstrip lines?
2. What are the properties of S-parameters?
3. What are the basic types of directional couplers?
4. How can a phase shifter be realized?
5. Draw the equivalent circuit model and reduced equivalent circuit for an up-converter.
6. Draw the typical structure and equivalent circuit of crystal diode.
7. Distinguish between TWTA and Klystron amplifier.
8. List the RF effects in tubes.
9. Write any two sensors used to measure the power.
10. What does VSWR determine?

Part-B (5x16=80 Marks)

- 11.(i) Write the common properties for S, Y and Z matrices. (8)
(ii) An air-filled co-axial transmission line has outer and inner conductor radii equal to 6 cm and 3 cm respectively. Calculate the values of inductance per unit length, capacitance per unit length and characteristic impedance of the line. (8)
- 12.(a)(i) How do you analyse the coupling coefficient using a coupled microstrip directional coupler? (8)
(ii) Draw the odd and even mode equivalent circuits of branch line coupler and explain. (8)
- OR**
- 12.(b)(i) What are the types of circulators? Write the design procedure for microstrip circulators. (8)
(ii) Distinguish between reciprocal and non-reciprocal phase shifters. (8)
- 13.(a)(i) A shunt mounted PIN diode in a TEM transmission line having characteristic impedance of 50Ω can be represented by a shunt impedance $Z = R + jX$. Calculate the insertion loss and isolation at a frequency of 2 GHz. The forward resistance $R_f = 0.1\Omega$ and capacitance $C = 0.02\text{ pF}$. (8)
(ii) An IMPATT diode with nominal frequency of 10 GHz has $C_j = 0.5\text{ pF}$, $L_p = 0.5\text{ nH}$ and $C_p = 0.3\text{ pF}$ at breakdown bias of 80 V and bias current of 80 mA. The RF peak current is 0.65 A for $R_d = -2\Omega$. Find the resonant frequency of oscillation and the efficiency. (8)

OR

- 13.(b)(i) How are the PIN diodes mounted across the transmission lines for switching applications? (8)
(ii) Explain the characteristics of TEDs. (8)

- 14.(a)(i) Explain the analysis of TWTA. (8)
(ii) Write a short note on Magnetrons. (8)

OR

- 14.(b) (i) Write the assumptions on which the analysis for RF amplification by a two cavity klystron amplifier is based. (8)
(ii) A pulsed cylindrical magnetron is operated with the following parameters:
Anode voltage = 25 KV
Beam current = 25 A
Magnetic flux density = 0.34 Wb/m^2
Radius of cathode cylinder = 5 cm
Radius of anode cylinder = 10 cm
Calculate angular frequency, cut-off voltage and the cut-off magnetic flux density. (8)

- 15.(a)(i) Write a short note on down conversion method to measure the frequency. (8)
(ii) Draw the block diagram for the slotted line method of impedance measurement and explain. (8)

OR

- 15.(b)(i) Explain the transmission method for Q measurement. (8)
(ii) Explain a method for high power measurement. (8)
-