6E3085

Roll No. _____

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B. Tech. VI Sem. (Main & Back) Exam., May/June-2014
Electronics & Comm. Engineering
6EC1 Microwave Engineering II

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT-I

Q.1 (a) Explain the VSWR measurement. [8]

(b) A slotted line is used to measure VSWR of the load at 2Ghz by double minima method. If the distance between the positions of twice minimum power is 0.5 cm, find the value of VSWR on the line and the magnitude of the voltage reflection coefficient. [8]

OR

Q.1 (a) Discuss the measurement of scattering parameters of a network. [8]

(b) The signal power at the input of a device is 10 mw. The signal power at the output of the same device is 0.20 mw. Calculate the insertion loss in dB of this component. [8]

UNIT-II

Q.2 (a) Describe the strip lines structures, higher order modes, losses and excitation of strip lines. [8]

(b) A microstrip line is constructed of a perfect conductor and a lossless dielectric board. The relative dielectric constant of the fiber glass –epoxy board is 5.23, and the line characteristic impedance is 50 Ω. Calculate this line inductance and this line capacitance. [8]

OR

Q.2 (a) Write down the comparison between slot line, micro strip line, integrated Fin line and Non-radiative guide. [8]

(b) A lossless parallel strip line has a conducting strip width w. The substrate dielectric separating the two conducting strips has a relative dielectric constant $\in_{rd}$ of 6 (beryllia) and a thickness d of 4 mm. Calculate -

(i) The required width W of the conducting strip in order to have a characteristic impedance of 50 Ω.

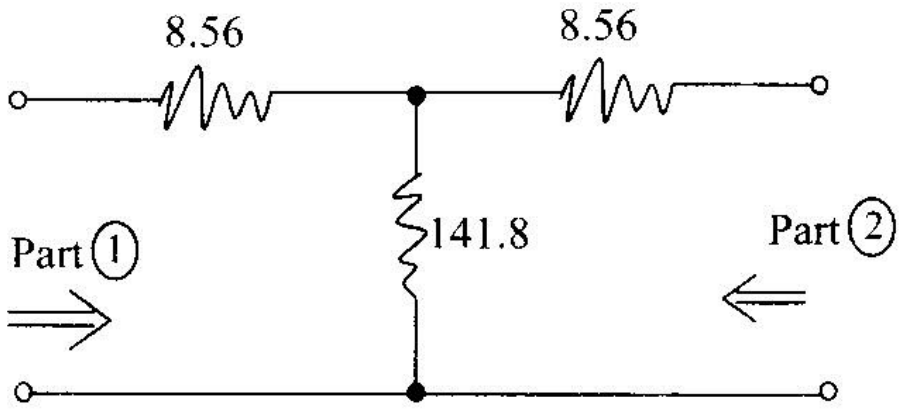
(ii) The strip –line capacitance

(iii) The strip-line inductance

(iv) The phase velocity of the wave in the parallel strip line. [8]

UNIT_III

Q.3 (a) Find the S- parameters of the 3db attenuator circuit shown in figure. [8]



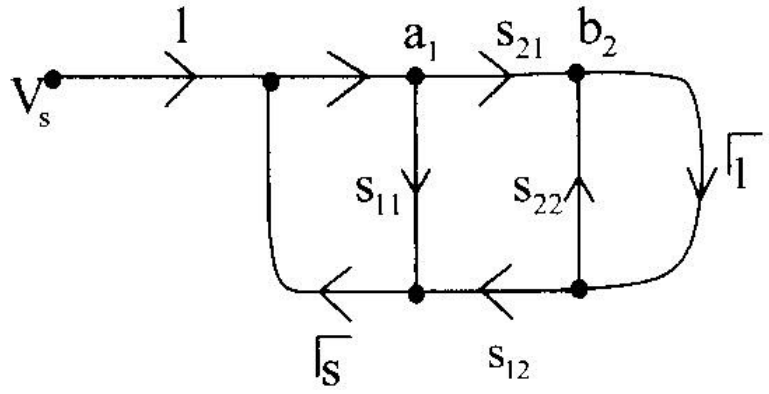
(b) A certain two-port network is measured and the following scattering matrix is obtained

$$[S]=\begin{bmatrix} 0.1\angle 0^\circ & 0.8\angle 90^\circ \\ 0.8\angle 90^\circ & 0.20.1\angle 0^\circ \end{bmatrix}$$

From this data, determine whether the network is reciprocal or loss less. If a short circuit is placed on port 2, what will be the resulting return loss at port 1? [8]

OR

Q.3 (a) Derive the expression for Γin for the terminated two-port network shown in figure using signal flow graphs and the decomposition rules. [8]



(b) The scattering parameters of a certain two-port network were measured to be $S_{11} = 0.3 + j\ 0.7$, $S_{12} = S_{21} = j0.6$, $S_{22}' = 0.3 - j\ 0.7$. Find the equivalent impedance parameters for this network, if the characteristic impedance is 50Ω.[8]

UNIT-IV

Q.4 (a) Explain how Gunn diodes are able to exhibit dynamic negative resistance. What are various materials used to make Gunn diodes? Why Si is not suitable for Gunn diodes. [8]

(b) A certain Silicon microwave transistor has the following parameters:
Reactance Xc = 1Ω, transit–time cut off frequency fr = 4 GHz, maximum electric field Em= 1.6×10^5 V/cm, saturation drift velocity Vs = 4×10^5 cm/s. Determine the maximum allowable power that the transistor can carry. [8]

OR

Q.4 (a) Discuss the principle of negative resistance in IMPATT diode. Explain the power output and efficiency of IMPATT. [8]

(b) In a Ga As Gunn diode, working at a frequency of 8 GHz, the threshold field is 3 KV/m, applied field is 3.5 KV/m, device length is 10×10^{-6} meter and doping constant is 10^{16} electrons /cm3. Calculate the current density and negative electron mobility in the device. [8]

UNIT V

Q.5 (a) List the materials and their characteristics required for an ideal substrate material.[8]

(b) A circular spiral inverter has the following parameters: numbers of turns n=5, Separation S = 100 mils, film width W= 50 mils. Compute the inductance. [8]

OR

Q.5 (a) Describe the MMIC techniques. [8]

(b) Discuss the capacitor film development. [4]

(c) Describe the inducter film formation. [4]
