

GUJARAT TECHNOLOGICAL UNIVERSITY**M.E –IIst SEMESTER–EXAMINATION – JULY- 2012****Subject code: 1710411****Date: 17/07/2012****Subject Name: RF and Microwave Engineering****Time: 10:30 am – 13:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) A plane wave propagating in a lossless dielectric medium **07**
 has an electric field given as,
 $E_x = E_0 \cos(1.51 \times 10^{10}t - 61.6z)$.
 Determine the wavelength, phase velocity, and wave impedance for this wave, and the dielectric constant of the medium.

(b) Explain Lossy transmission line in detail. **07**

Q.2 (a) Consider a plane wave normally incident on a half-space of **07**
 copper. If $f = 1$ GHz, compute the propagation constant, impedance, and skin depth for the conductor. Also compute the reflection and transmission coefficients. For copper, $\sigma = 5.813 \times 10^7$ S/m.

(b) Plane Wave Reflection from a Media Interface. **07**

OR

(b) “Smith Chart is a graphical aid that is very useful when **07**
 solving transmission line problems”, Justify this statement with suitable example.

Q.3 (a) Find the S parameters of the 3 dB attenuator circuit shown **07**
 in below Figure A.

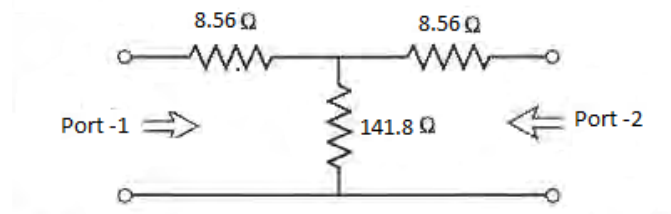


Figure A :A matched 3 dB attenuator with a 50 Ω characteristic impedance

(b) Explain the Transmission (ABCD) Matrix in detail. **07**

OR

- Q.3 (a)** A two-port network is known to have the following scattering matrix: **07**

$$[S] = \begin{bmatrix} 0.15\angle 0^\circ & 0.85\angle -45^\circ \\ 0.85\angle 45^\circ & 0.2\angle 0^\circ \end{bmatrix}$$

Determine if the network is reciprocal, and lossless. If port two is terminated with a matched load, what is the return loss seen at port 1? If port 2 is terminated with a short circuit, what is the return loss seen at port 1?

- (b)** Write short notes on Excitation of Waveguides-Aperture Coupling. **07**

- Q.4 (a)** Write Short Notes On Chebyshev Multi-section Matching Transformers. **07**

- (b)** A lossless T-junction power divider has a source impedance of $50\ \Omega$. Find the output characteristic impedances so that the input power is divided in a 2:1 ratio. Compute the reflection coefficients seen looking into the output ports. **07**

OR

- Q.4 (a)** Consider a microstrip resonator constructed from a $\lambda/2$ length of $50\ \Omega$ open circuited microstrip line. The substrate is Teflon ($\epsilon_r = 2.08$, $\tan\delta = 0.0004$, $W = 0.508\text{cm}$, $\epsilon_c = 1.80$), with a thickness of 0.159 cm . The conductors are copper. Compute the length of the line for resonance at 5 GHz , and the Q of the resonator. Ignore fringing fields at the end of the line. **07**

- Q.4 (b)** Briefly explain Constant- k filter Sections. Also give image Parameter of T and π Networks. **07**

- Q.5 (a)** Write short notes on Ferrite Isolators. **07**

- (b)** Explain Oscillator Phase Noise **07**

OR

- Q.5 (a)** Explain Balanced Microwave Amplifiers. **07**

- (b)** Write short notes on Monolithic Microwave Integrated Circuits. **07**
