

GANPAT UNIVERSITY
M.Tech (EC) Semester -I CBCS Regular Examination, Dec. 2014
Advanced Microwave Engineering (3EC102)

[Max. Time: 3 Hrs.]

[Max. Marks: 60]

Instructions:

1. Attempt **all** questions.
2. Answers to the **two** sections must be written in **separate** answer books.
3. Figures to the **right** indicate full marks.
4. **Assume** suitable data, if necessary.

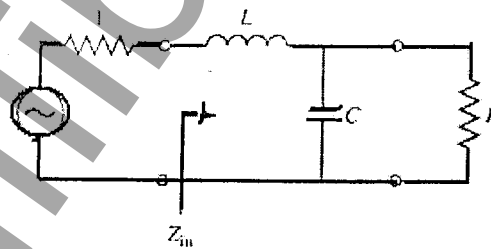
SECTION-I

- Q-1 (A) What is importance of $K-\beta$ diagrams and wave velocities for microwave components and transmission lines? Discuss the concept of power loss ratio for maximum flat, Equal ripple, Elliptic and linear phase practical filter responses requirements. 5
- (B) Prove that 3 port circulator device is non-reciprocal, lossless and matched at all its port device. 5

OR

- Q-1 (A) A lossless T junction has source impedance $Z_0 = 50 \Omega$. Find output characteristic impedance so that power is divided in 2:1 ratio. Also calculate reflection coefficients while looking in to output ports. 5
- (B) Why amplitude and frequency scaling is required in filter design procedure? Discuss Richard's transformations and Kuroda's identities. 5

- Q-2 (A) For shown below figure prove that proto type filter's component values are $L=C=\sqrt{2}$ and $R=1$. 5



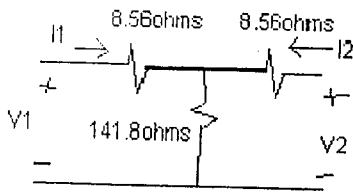
- (B) Discuss with required equations about design issue of Wilkinson power dividers. 5

OR

- Q-2 (A) Discuss the concept of LPF to HPF transformation process with suitable equations and graphs. 5
- (B) Discuss in detail about properties of Directional coupler. Also define coupling, Directivity and Isolation for the same. 5
- Q-3 (A) Write short note on Pulse-Doppler radar and synthetic aperture radar (SAR). 5
- (B) Discuss in brief about general Radar Range Equation and Radar Ambiguity Functions. 5

SECTION – II

Q-4 (A)

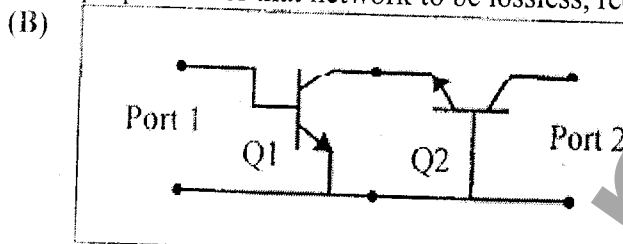


Find S parameter values for given circuit and prove that it is 3-dB attenuator circuit.

(B) For analysis of a two port network which is lossless, using ABCD parameter prove that $AD-BC=1$. List out useful properties of Chebyshev polynomials and draw it for first four polynomials.

OR

Q-4 (A) Suppose given microwave network is 3 port device. With help of its S matrix discuss about its properties for that network to be lossless, reciprocal and matched at all port conditions.



For given circuit ABCD parameters of two stages are

$$\begin{aligned} A_{Q1} &= 0.086 \angle -26^\circ & A_{Q2} &= 0.094 \angle -151^\circ \\ B_{Q1} &= 10.3 \angle -116^\circ & B_{Q2} &= 11.21 \angle 61^\circ \\ C_{Q1} &= 0.005 \angle -63^\circ & C_{Q2} &= 0.005 \angle 112^\circ \\ D_{Q1} &= 0.339 \angle -73^\circ & D_{Q2} &= 1.01 \angle 18^\circ \end{aligned}$$

Find out resultant ABCD matrix for the same.

Q-5 (A) Discuss about Analytic method of impedance matching with lumped elements. 5
 (B) With suitable equations discuss about designing procedure of quarter wave transformer for impedance matching. 5

OR

Q-5 (A) Discuss the concept of theory of Small reflection and for that proves, total reflection is dominated by reflection from initial discontinuity and first reflection from second discontinuity. 5

(B) What is the significance of Bode – Fano criterion in designing a network for impedance matching purpose? Discuss it with necessary detail. 5

Q-6 (A) Match a load impedance of $Z_L = 100 + j80 \Omega$ to a 50Ω line using a single series open –circuited stub. Assuming that the load is matched at 2 GHz. Using smith chart calculate two possible values of distance d and length l of stub for the same purpose. 5

(B) What is ABCD matrix? Derive ABCD matrix for 3 stage cascaded two port circuits. What are special advantages of using it as compare to other parameters for analysis purpose? 5

