

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION)**

CLASS: BE  
BRANCH: ECE

SEMESTER: V  
SESSION : MO/2018

**SUBJECT : EC5203 MICROWAVE ENGINEERING**

TIME: 1.5 HOURS

FULL MARKS: 25

**INSTRUCTIONS:**

1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

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- Q1 (a) Write the frequency band designations recommended by IEEE? [2]  
(b) Discuss the advantages of microwave frequencies compared to low frequency waves. [3]

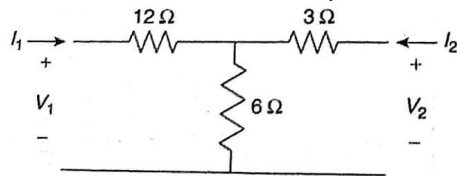
- Q2 (a) Write the name of four substrates suitable for MMICs. [2]  
(b) What is the difference between EMI and EMC? Describe the techniques to minimize the Electromagnetic interferences. [3]

- Q3 (a) Derive unitary property of [S] matrix which can be stated as  $[S]^*[S] = [I]$ . [2]  
(b) A two-port network is driven at both ports such that the port voltages and currents have the following values: [3]

$$\begin{aligned} V_1 &= 20 \angle 0^\circ & I_1 &= 0.4 \angle 90^\circ \\ V_2 &= 4 \angle -90^\circ & I_2 &= 0.08 \angle 0^\circ \end{aligned}$$

Determine the (i) input impedance seen at each port, and (ii) the incident and reflected voltages at each ports.

- Q4 (a) Derive expressions that give the impedance parameters in terms of the ABCD parameters. [2]  
(b) Find the Z matrix and ABCD parameters of a two port network given below [3]



- Q5 (a) Describe the operation of Two-hole waveguide coupler. [2]  
(b) Shows that half of the supplied power is dissipated in the resistors of the equal split resistive power divider. [3]

- Q6 (a) What are properties of Quadrature Hybrid coupler? Write the S-matrix for Quadrature ( $90^\circ$ ) Hybrid coupler. [2]  
(b) Calculate the length, even and odd mode impedances of a single section coupled line coupler with a coupling of 19.1 dB, a system impedance of  $60\ \Omega$  centre frequency of 8 GHz and relative permittivity of 2.2. [3]