BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: M.TECH/PRE-PHD   SEMESTER : Ist
BRANCH: ECE   SESSION : MO/2023

SUBJECT: EC505 MICROWAVE THEORY AND ANTENNA

TIME: 3 HOURS   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Prove that the impedance and admittance matrices are symmetric for reciprocal networks and purely imaginary for lossless networks.	[5]	3	4
Q.1(b)	A two port network is driven at both ports such that the port voltages and currents have the following values ($Z_0=50\Omega$) $V_1=20<0^0$ $V2=4<-90^0$ $I_1=0.4<90^0$ $I_2=0.08<0^0$ Determine the input impedance seen at each port, and find the incident and reflected voltages at each port.	[5]	3	3
Q.2(a)	Discuss briefly how the lossless and resistive divider is different from each other? (With diagram)	[5]	2	3
Q.2(b)	A 2W power source is connected to the input of a directional coupler with C=20dB,D=25dB,and an insertion loss of 0.7dB.Find the output powers (in dBm) at the through ,coupled and isolated ports. Assume all ports to be matched.	[5]	3	3
Q.3(a)	Explain Floquet theorem. What is the significance of spatial harmonics and Bloch wave?	[5]	3	3
Q.3(b)	Derive the expression of the Bloch-wave reflection coefficient and input impedance if periodic structure is terminated at load impedance at the Nth terminal plane.	[5]	2	4
Q.4(a)	Define the following terms- Radiation intensity, directive gain, Antenna efficiency, Major and Minor lobes	[5]	2	2
Q.4(b)	i) Write down the different free space ranges (name only) used for antenna test . ii)What are the two basic methods used to measure the gain of an antenna.?(Name only) iii)Two dipoles (antenna) gain 1.64 each are used for transmitting and receiving purposes. They are separated by a distance of 10m. The radiated power by the transmitting antenna is 15W at a frequency of 60MHZ. determine the receiving power.	[1+1+3=5]	3	3
Q.5(a)	Explain the difference between mobile station and base station antennas with their applications.	[5]	4	4
Q.5(b)	Write short notes on Cell tower trees and antennas for biomedical Applications	[5]	4	3

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