REG.NO.: 22BEC0457

VIT
Vellore Institute of Technology

SCHOOL OF ELECTRONICS ENGINEERING
CONTINUOUS ASSESSMENT TEST - I
WINTER SEMESTER 2024-2025

SLOT: D1

Programme Name & Branch : B. Tech - ECE
Course Code and Course Name : BECE305L – Antenna and Microwave Engineering
Faculty Name(s) : Dr. Shambavi K, Dr. Poonkuzhali R, Dr. Kannadassan D
Class Number(s) : VL2024250500657, 58, 59
Exam Duration : 90 minutes

Maximum Marks: 50

Answer All Questions

BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

- CO4: Design and analyze the passive components at microwave frequencies.
- CO5: Design and analyze the various passive circuits at microwave frequencies.

	Question	M	CO	BL
	The measured S matrix of a microwave network is given below. (i) Verify the matched, lossless, and reciprocal properties. (ii) Calculate the insertion loss between port-1 and 3, when all other ports are properly matched? (iii) What is the input reflection coefficient seen at port-1 when port-3 is short circuited and all other ports are matched. $[S]=\begin{bmatrix} 0.12\angle 90^\circ & 0.7\angle 45^\circ & 0.3\angle 45^\circ & 0 \\ 0.7\angle 45^\circ & 0 & 0 & 0.4\angle -45^\circ \\ 0.3\angle 45^\circ & 0 & 0 & 0.3\angle -45^\circ \\ 0 & 0.4\angle -45^\circ & 0.3\angle -45^\circ & 0 \end{bmatrix}$	10	4	3
2.	(a) A circulator has following S-matrix at its operating frequency 5 GHz, calculate the insertion loss and isolation. $[S]=\begin{bmatrix} 0.001 & 0.95 & 0.097 \\ 0.097 & 0.001 & 0.95 \\ 0.95 & 0.097 & 0.001 \end{bmatrix}$ (b) A 30 W signal is fed into the collinear port 1 of a lossless H-plane tee junction. Calculate the power delivered through each port when other ports are terminated in matched load.	5 5	4	3
3.	(a) A lossless T junction power divider has a source impedance of 50 Ω. Find the output characteristic impedances so that the input power is divided in 3:2 (P3:P2) ratio at 3 GHz. (b) Design a branch-line coupler to achieve 5 dB coupling for a system impedance of 45 Ohm and operating frequency of 6 GHz. Draw the typical layout of the coupler.	5 5	5	3
4.	Design a 4th order maximally flat low pass filter with open-circuited shunt stubs for cut-off frequency 3 GHz. The filter is connected between a load of 75 Ω and a generator with its internal impedance of 75 Ω. Draw the typical layout of the final filter circuit. [g1=1.6703; g2=1.1920; g3=2.3661; g4=0.8419]	10	5	3
5.	Design a 50 Ω Chebyshev low pass filter with a cutoff frequency of 2 GHz, Insertion loss of at least 27 dB at 2.4 GHz and pass band ripple of 0.5 dB. Realize the filter circuit using stubs only. High and low impedances are 110 Ω and 20 Ω. Draw the typical layout of the final filter circuit.	10	5	3

N	g1	g2	g3	g4	g5	g6	g7	g8	g9	g10	g11
1	0.6986	1.0000									
2	1.4029	0.7071	1.9841								
3	1.5963	1.0967	1.5963	1.0000							
4	1.6703	1.1926	2.3661	0.8419	1.9841						
5	1.7058	1.2296	2.5408	1.2296	1.7058	1.0000					
6	1.7254	1.2479	2.6064	1.3137	2.4758	0.8696	1.9841				
7	1.7372	1.2583	2.6381	1.3444	2.6381	1.2583	1.7372	1.0000			
8	1.7451	1.2647	2.6564	1.3590	2.6964	1.3389	2.5093	0.8796	1.9841		
9	1.7504	1.2690	2.6678	1.3673	2.7239	1.3673	2.6678	1.2690	1.7504	1.0000	
10	1.7543	1.2721	2.6754	1.3725	2.7392	1.3806	2.7231	1.3485	2.5239	0.8842	1.9841