

**VIT**Vellore Institute of Technology
(Approved by the Government of India)**SCHOOL OF ELECTRONICS ENGINEERING**

Course Code : BECE305L

CAT – I, Fall Semester 2024-25

: E1+TE1

Course Name : Antenna and Microwave Engineering

Slot
Max. Marks : 50**General instruction(s): Answer ALL Questions**

Q. No	Question	Marks
1.	A two-port network has the scattering matrix shown as follows. $S = \begin{bmatrix} 0.6\angle 45^\circ & 0.8\angle 60^\circ \\ 0.8\angle 60^\circ & 0.6\angle 45^\circ \end{bmatrix}$ (i) Is this network lossless? (ii) Is this network reciprocal? (iii) What is the insertion loss and phase delay between ports 1 and 2? (iv) What is the reflection coefficient seen at port-1 if a short circuit is placed at the terminal plane of port 2.	10
2.	A directional coupler has the scattering matrix given below. $[S] = \begin{bmatrix} 0 & 0.827 & 0.562 & 0.0031 \\ 0.827 & 0 & 0.0031 & 0.562 \\ 0.562 & 0.0031 & 0 & 0.827 \\ 0.0031 & 0.562 & 0.827 & 0 \end{bmatrix}$ (i) Find the directivity, coupling, isolation, return loss at the input port when other ports are terminated in matched loads. (ii) What is the power at coupling port for the input power -7 dB.	10
3.	a. Design a Wilkinson power divider to split the input power with ratio 4:3 (P3:P2) for operating frequency of 3.5 GHz and system impedance of 60 Ω. Draw the planar structure with scaled size. b. With neat diagram, explain the working of 180° Hybrid coupler for input power at (a) port-1 and (b) port-4.	6 4
4.	Design a planar low-pass filter using open-circuited shunt stubs for the cutoff frequency 4 GHz, order 4, pass-band ripple of 3 dB, and impedance 50 Ω. The normalized filter coefficients are: $g_1=3.4389, g_2=0.7483, g_3=4.3471, g_4=0.5920$ Draw the typical layout of the final filter circuit.	10
5.	For a radar system, design a stepped-impedance 6th order low-pass filter with maximum rippling of 3.0 dB in the pass band with cutoff frequency of 2.5 GHz and system impedance is 75 Ω. The practical line impedance is 110 Ω, and the lowest is 15 Ω. Draw the probable filter architecture/layout. Normalized filter coefficients are: $g_1=3.5045, g_2=0.7685, g_3=4.6061, g_4=0.7929, g_5=4.4641, g_6=0.6033$.	10