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Internal Assessment Test 2 – April. 2018

Sub:	Microwave Theory and Antenna					Sub Code:	15TE63	Branch:	TCE
Date:	/04/2018	Duration:	90 mins	Max Marks:	50	Sem / Sec:	6		OBE

Answer any FIVE FULL Questions

		MARKS	CO	RBT
1	State and prove symmetric and unitary properties of S-matrix.	[10]	CO2	L2
2	A two-port network is known to have the following scattering matrix: $\begin{bmatrix} 0.15\angle 0^\circ & 0.85\angle -45^\circ \\ 0.85\angle 45^\circ & 0.2\angle 0^\circ \end{bmatrix}$ Determine if network is reciprocal and lossless. If port 2 is terminated with a matched load, what is the return loss seen at port 1? If port 2 is terminated with short circuit, what is the return loss seen at port 1?	[10]	CO2	L4
3	What is magic tee? Derive the S-matrix of magic tee. Mention its applications.	[10]	CO2	L3
4	With the help of neat diagram, explain the working of a precision phase shifter.	[10]	CO2	L3
5	A lossless parallel strip line has copper conducting strips each of width 18 mm separated by quartz dielectric of dielectric constant 3.8 with thickness of 2.5 mm. The conductivity of copper is 5.8×10^7 mhos/m and that of quartz is 2×10^{-4} mhos/m. The frequency of operation is 12 GHz. Determine a) Characteristic impedance of parallel strip line b) Phase velocity of propagating wave c) Strip-line inductance d) Series resistance for both strips e) Strip-line capacitance f) Shunt conductance of the dielectric g) Attenuation constant for conductor losses h) Attenuation constant for dielectric losses	[10]	CO2	L4
6	Define the following with respect to antennas: a) Radiation pattern b) Directivity c) Gain d) Effective aperture e) Beam area	[10]	CO3	L2
7	The normalized field pattern of an antenna is given by $E_n = \sin\theta \sin\phi$, where, Θ = zenith angle (measured from z-axis) and ϕ = azimuth angle (measured from x-axis), E_n has a value only for $0 \le \theta \le \pi$ and $0 \le \phi \le \pi$ and is zero elsewhere (pattern is unidirectional with maximum in +y direction). Find a) The exact directivity b) The approximate directivity c) The decibel difference	[10]	CO3	L4
8.	a) Derive an expression for directivity in terms of maximum effective aperture of an antenna.	[5]	CO3	L3
	b) Derive the Friis transmission equation and mention its significance.	[5]	CO3	L3