Ref.No: EX/PG/ETCE/T/127E/2018

M.E. (ETCE) 1st YEAR EXAMINATION, 2018
(2nd Semester)

MICTRSTRIP COMPONENTS AND CIRCUITS

Time: Three hours | Full Marks 100

No. of questions		Marks
	Answer *question no. 1* and any *four* from the rest.	
1.	For each of the following five types of transmission line, draw the cross-sectional view and plot the approximate configuration of electric and magnetic fields therein:	
(i)	Stripline	
(ii)	Slotline	
(iii)	Microstrip	
(iv)	Iinverted microstrip	
(v)	Unilateral finline	5X4
2.(a)	Prove that the mode of propagation in microstrip is quasi-TEM.	6
(b)	Discuss how computation of capacitance per unit length of a microstrip line and its air-filled counterpart can be used to calculate characteristic impedance of the line.	6
(c)	Write a note on microstrip on ferrite substrates.	8
3.(a)	What were the assumptions made by Schneider in calculating the dispersive effective dielectric constant?	4
(b)	What factors determine the maximum operating frequency limit of microstrips?	2
(c)	Propose a modification to the basic microstrip geometry where this limit can be significantly enhanced with reasons for the same.	4
(d)	Draw the lumped circuit equivalent of (i) a series gap, (ii) a symmetric step and (iii) a narrow transverse slit along a microstrip line.	6
(e)	Would the last model work if the slit is too wide? Justify your answer.	2
(f)	Is it more convenient to realize a shorted stub or an open stub in microstrip version? Why is it so?	2
4.(a)	An antenna, as load on a transmission line, produces a standing wave ratio of 2.8 with a voltage minimum 0.12λ from the antenna terminals. Find the antenna impedance and the reflection factor at the antenna, if $R_0=300\Omega$ for the line.	10
(b)	A lossless line $(7/16)\lambda$ long has an input impedance $Z_s/R_0=1.2+j0.95$. Find the load impedance and the standing wave ratio.	10
5.(a)	For surface waves on a dielectric coated conducting surface, determine the propagation constant for an appropriately chosen mode.	14
(b)	Hence show that the phase velocity for this wave will be intermediate between its value in air and that in the dielectric.	4
(c)	Also comment on whether a situation can be created where no such mode is excited.	2

6.(a)	Discuss the existence of even and odd modes in a coupled coaxial system with relevant figures.	6
(b)	For a coupled TEM system, show how the even and odd mode characteristic impedances are determined for a given amount of coupling.	14
7.(a)	Elaborate the Galerkin technique in spectral domain as applied to open micostrip lines.	12
(b)	Choose two simple current basis functions along two orthogonal directions fulfilling the symmetry requirements and compute their Fourier transforms.	8
8.(a)	Explain the cavity model of analysis of patch antennas with proper diagrams.	4
(b)	Using this model, determine the nature of the internal fields confined to the region below the patch.	8
(c)	Thus obtain the radiated fields from this antenna.	8