Ref.No: EX/PG/ETCE/T/127E/2024

M.E. (ETCE) 1st YEAR EXAMINATION, 2024
(2nd Semester)

MICROSTRIP COMPONENTS AND CIRCUITS

Time: Three hours | Full Marks 100

No. of questions | Marks

Answer *Question no. 1* and any *four* from the rest.
All questions except Q. 1 carry equal marks.
Values of physical constants may be assumed, if necessary.

1. Choose the correct alternative in each case:

a) Slotlines, as compared to microstrip lines are more suitable for mounting of
   (i) Components in shunt
   (ii) Both components in shunt and components in series
   (iii) Components in series
   (iv) None of these

b) For a planar transmission line fabricated on glass substrate compared to an identical line fabricated on silicon substrate, it will be
   (i) More lossy
   (ii) Less lossy
   (iii) Similarly lossy
   (iv) May be more lossy or less depending on other parameters

c) For a microstrip line operated at high frequencies, the signal velocity
   (i) Decreases nonlinearly with frequency
   (ii) Decreases linearly with frequency
   (iii) Increases nonlinearly with frequency
   (iv) Increases linearly with frequency

d) Pure TEM mode of propagation is supported by
   (i) Slotlines
   (ii) Finlines
   (iii) Microstrip
   (iv) Striplines

e) Compared to microsptrip lines, inverted microstrips can operate over
   (i) Lower frequency ranges
   (ii) Higher frequency ranges
   (iii) Similar frequency ranges
   (iv) Higher temperature

f) Etched on the same substrate, an 100 ohm line will be
   (i) Of same width as a 50 ohm line
   (ii) Wider than a 50 ohm line
   (iii) Narrower than a 50 ohm line
   (iv) May be wider than a 50 ohm line or may be narrower — 2X6 =12

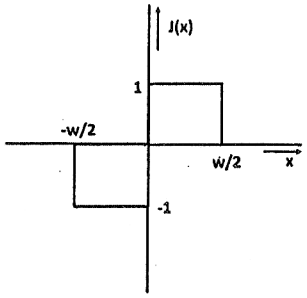
2. (a) What do you by primary and secondary constants of a line? — 4

(b) For a coaxial cable, draw the electric and magnetic field patterns over its cross section. — 4

(c) Prove that any value of reactance can be realized by either a short circuited or an open circuited stub. — 6

(d) Discuss, in the context of microstrip, which type of substrate should be more suitable for antenna application and which type should be more suited for circuit application, — 4

[Turn over

(e)	Design a quarter wave transformer to match a 50 ohm line to a 100 ohm load.	4
3.(a)	Discuss qualitatively why the shape ratio (w/h) is more important than line width (w) for a planar line.	4
(b)	How can the maximum frequency of operation of such a line be determined?	6
(c)	Draw the standing wave patterns for both voltage and current along a 50 ohm line terminated by 225 ohms.	4
(d)	What are the values of reflection coefficient and VSWR along the line?	4
(e)	What is the input impedance of an infinite line? Justify the result logically.	4
4.(a)	Describe how the finite difference technique can be used to determine the characteristic Impedance of a microstrip line.	12
(b)	Obtain the Fourier transform of 	10
5. (a)	Consider three lossless lines (each operating at 900 MHz with phase velocity $2.5X10^8$ m/sec) as follow Line 1: Z_0=70Ω, length=43.5 cm terminated by j70Ω; Line 2: Z_0=90Ω, length=21 cm terminated by 40Ω; Line 3: Z_0=50Ω, length=19.5 cm terminated by the shunt combination of Line1 and Line2. Find input impedance of Line 3.	10
(b)	Also find the VSWR along all three lines.	6
(c)	How is the characteristic impedance of a line measured?	6
6. (a)	With reference to a pair of coupled lines, explain the existence of odd and even modes.	6
(b)	Prove that $Z_0=\sqrt{(Z_{0o}Z_{0e})}$ for it with the symbols having their usual meaning.	12
(c)	Why is such a device called Quadrature Coupler?	4
7. (a)	Write short essay on variants of microstrip.	12
(b)	Describe any one full wave method of microstrip analysis.	10