

**B.E. ELECTRONICS AND TELE-COMMUNICATION ENGINEERING
FOURTH YEAR SECOND SEMESTER - 2019**

MONOLITHIC MICROWAVE INTEGRATED CIRCUITS

Time: Three hours

Full Marks:100

Answer *any four* questions

1. a) Write advantages and disadvantages of MMIC. What is multi-chip module technology? [3+2]
b) Discuss on the design principle of planar inductor and capacitors using planar transmission line for MMIC? [8]
c) Discuss on different planar microstrip couplers and power splitters. [12]
2. a) Derive the equations for output stability circles. Draw and explain output stability circles for conditionally stable devices. [8+3]
b) A microwave transistor has the following S parameters: $S_{11} = 1.3\angle 140^\circ$, $S_{21} = 2\angle -85^\circ$, $S_{12} = 0.2\angle 130^\circ$, $S_{22} = 1.15\angle -55^\circ$. Determine its stability and calculate load and source stability circle parameters. [6]
c) Assuming all required parameters show that for one-port oscillator, $\Gamma_L \Gamma_{in} = 1$. How will you design a transistor based RF oscillators? [3+5]
3. a) What are the differences between single ended, single balanced, and double balanced mixers? Discuss the design principle of a single ended microstrip mixer. Draw schematic diagram of double-balanced resistive FET mixer. [6+4+4]
b) Discuss the design principle of FET distributed mixer. How can you implement it using microstrip technology? [6+5]
4. a) Draw the schematic diagram of a switched attenuator consists of FET based SPDT switch and discuss its working principle. [8]
b) How will you use PIN diodes to implement different single pole double throw series/shunt switches in RF circuits? Calculate IL for those switch circuits. [5+4]
c) Draw the circuit diagram of a single stage reflection type phase shifter and discuss its working principle. [8]

[Turn over

5. a) Design a 6 dB attenuator circuit for 75 Ohm system. Derive all required expressions. [13]

b) Considering $R=1$ Ohm, analyze the performances of the following circuit [Figure 1]. Plot its response for 1 to 2 GHz. [10+2]

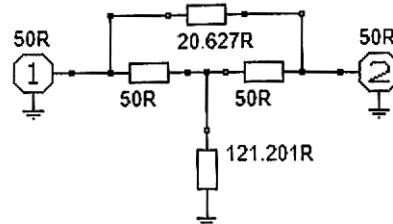


Figure 1

6. Write short notes on: [5x5]

- i) Planar transmission lines
- ii) Schottky Diodes
- iii) Microstrip line discontinuities
- iv) Digital Attenuator design techniques
- v) Loaded line phase shifters