BE, sem.- VIII, Elect. & Telecomm., FM2018 16/05/18

OTR

Microwave Integrated Circuits

Q.P.Code:13984

Max Marks: 80
Duration: 03 Hrs.

1. Question No. 1 is compulsory.
2. Out of remaining questions, attempt any three questions.
3. Assume suitable additional data if required.
4. Figures in brackets on the right hand side indicate full marks.

1. (A) Explain Stability circles and its importance in amplifier design. (05)
   (B) Compare HMICs with MMICs. (05)
   (C) Discuss microwave amplifier versus microwave oscillators. (05)
   (D) List and explain various performance parameters of mixer. (05)

2. (A) Derive the dispersion relation for open microstrip line. (10)
   (B) Give limitations and criteria for the choice of substrate material in HMICS and MMICS. (10)

3. (A) Derive the transducer power gain as: (10)

$$G_T = \frac{P_L}{P_{avg}} = \frac{|S_{21}|^2(1-|\Gamma_s|^2)(1-|\Gamma_L|^2)}{|1-\Gamma_s\Gamma_{in}|^2|1-S_{22}\Gamma_L|^2}$$

   (B) Explain Green's Function and discuss its application. (10)

4. Design an amplifier to have gain of 10 dB at 6 GHz using a transistor with the following s-parameters ($Z_0 = 50\ \Omega$) $S_{11} = 0.61 \angle -170°$, $S_{12} = 0$, $S_{21} = 2.24 \angle 32°$, $S_{22} = 0.72 \angle -83°$ Plot constant gain circles for Gs = 1 dB and GL = 2 dB. Use matching sections with open circuited shunt stubs. (20)

5. (A) For two port oscillator at steady state oscillation, prove that if: $\Gamma_L\Gamma_{in} = 1$ then $\Gamma_T\Gamma_{out} = 1$. (10)
   (B) Design a lange coupler with a center frequency of 4 GHz and with $N = 4$, $C = 0.5$ and $Z_{on} = 30\ \Omega$. Determine the line width and spicing required if an alumina substrate with $h = 0.635$ mm and $\varepsilon_r = 9.8$ is to be used. (10)

6. (A) Give briefs of Balanced FET Mixers. (10)
   (B) Discuss amplifier linearization methods. (10)
