B.E. Sem. VIII (Rev) EXTC Dec 07

Elective-II - Microwave Amplifier & Oscillator Design

Con. 5487-07. CD-6498

(REVISED COURSE)

(3 Hours) **[Total Marks : 100**

N.B (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions of the remaining questions.
(3) Use of Smith Chart is **compulsory**.
(4) Assume **suitable** data wherever **required** but justify the **same**.
(5) Illustrate answers with sketches.

1. The s-parameters of a BJT measured at V_{CE}= 10 V, I_c = 30 mA and f = 1GHz in a 50 Ω system are : **20**

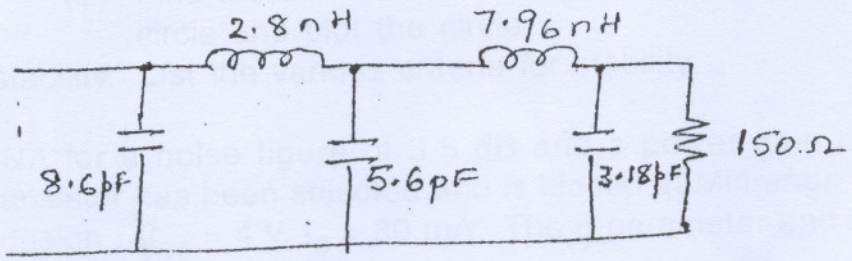
$S_{11} = 0{\cdot}73 \angle 175°$; $S_{12} = 0$;

$S_{21} = 4{\cdot}45 \angle 65°$; $S_{22} = 0{\cdot}21 \angle -80°$.

(i) Calculate the optimum terminations
(ii) Calculate G_{smax}, G_{Lmax} and G_{tumax} in dBs.
(iii) Draw constant gain circles 2, 1, 0, – 1 dB.

2. (a) A wideband amplifier (2-4 GHz) has gain of 10dB, an output power of 10dBm and a noisefigure of 4 dB at room temperature. Find the output noise power in dBm. **10**
(b) Derive the expression for noise figure for multistage amplifier. **10**

3. (a) In the circuit shown in **figure**, determine input impedance at frequency 1 GHz using the Smith Chart. **15**



(b) What are the essential criteria for oscillations. **5**

4. (a) A GaAs MESFET has the following S parameters : **16**

V_{DS} = 4 V, I_{DS} = 0·9 I_{DSS} for 9G Hz.

$S_{11} = 0{\cdot}55 \angle -150°$ $S_{21} = 2{\cdot}82 \angle 180°$

$S_{12} = 0{\cdot}04 \angle 20°$ $S_{22} = 0{\cdot}45 \angle -30°$

Design the input and output matching network for maximum power gain.
(b) Define 1dB compression point and dynamic range. **4**

5. (a) Find the input impedance, the reflection coefficient and the VSWR in a transmission line having an electrical length of 90° with Z_0 = 50 Ω and temrinated in the load Z_L = 50 + j100 Ω **10**
(Use Smith Chart)
(b) Analyse a one port NR oscillator and explain Kurokawa's criteria. **10**

6. (a) Explain how noise in oscillators can be determined. **8**
(b) Write a note on PIN diode. **8**
(c) Explain dielectric resonator oscillator in detail. **4**

7. Explain the following in detail :— **20**
(a) Microwave phase shifters
(b) Double Balanced Mixers
(c) Varactor diodes
(d) Switching Configuration.