

GANPAT UNIVERSITY
M.TECH SEM. II ELECTRONICS & COMMUNICATION ENGINEERING
CBCS REGULAR EXAMINATION, May/June-2013

3EC205 [Elective (RF Circuits)]

TIME: 3 Hrs.]

[TOTAL MARKS: 70

INSTRUCTIONS:

1. Attempt **all** questions.
2. Answers to the two sections must be written **in separate** answer books.
3. Figures to the **right** indicate **full** marks.
4. **Assume** suitable data, if necessary.

SECTION-I

- Que-1** **A** The Y factor method is used to measure the noise figure of an amplifier with a noise source having ENR= 20 dB and cold load at temperature of 77° K. If the Y factor ratio is measured to be 16.285 then calculate the noise figure of the same amplifier. 6
- B** Discuss about design for maximum gain of a single stage amplifier. 6
- OR**
- Que-1** **A** An amplifier with a bandwidth of 1GHz has a gain of 15 dB and a noise temperature of 250K. If the 1dB compression point occurs for an input power level of -10 dB then what will be linear dynamic and spurious free dynamic range values for it. 6
- B** Derive necessary equations for two port power gains of a two port network with general source and load impedance. 6
- Que-2** **A** Prove with required equations that if X_1 and X_2 are inductors and X_3 are capacitor in common Emitter BJT then resulting circuit will be Hartley oscillator. Also write equations of frequency of oscillation for Colpitts and Hartley oscillator. 6
- B** Derive necessary equations of Γ_{in} and Γ_{out} for transistor based oscillator circuits. 5
- OR**
- Que-2** **A** What is the importance of phase noise in oscillator circuits? Derive Manley – Rowe relation equations of non linear reactive element for its power conservation associated with frequency conversion. 6
- B** Discuss about Balanced amplifier with all necessary equations. 5
- Que-3** **A** Explain about Ferrite based resonance isolators. 4
- B** Discuss in detail about non reciprocal latching phase shifter devices. 4
- C** A receiver has a noise figure of 7 dB, a 1dB compression point of 25dBm, a gain of 40dB and a third order intercept point of 35dBm. If the receiver is fed with an antenna having a noise temperature of $T_A=150^\circ$ K and desired output SNR is 10 dB then calculate linear and spurious free dynamic range values of the same. Assume a receiver bandwidth of 100MHz. 4

SECTION-II

- Que-4** A Derive the equation of voltage gain of a signal component at frequency W_0 . Also comment on 1dB compression point of a non linear amplifier. 6
 B Derive necessary equation of noise figure of a passive two port network. 6
 OR
- Que-4** A What do you mean by third order inter modulation effect? Define linear dynamic and spurious free dynamic range with suitable equations. 6
 B Derive the generalized equations of noise figure and noise temperature for N stage cascaded system. 6
- Que-5** A Explain Y factor method for measuring the equivalent noise temperature of an amplifier. 6
 B Draw the schematic symbol of gyrator. Discuss about working of non reciprocal Faraday rotation phase shifters. 5
 OR
- Que-5** A Derive in general the maximum range equation of a RADAR system. 6
 B Discuss about ferrite circulators and comment on properties of a mismatched circulator with help of suitable S matrix. 5
- Que-6** A Briefly discuss Passive inter modulation and Dielectric Resonator Oscillator 4
 B Discuss about both tests for unconditional stability. 4
 C The S parameters for HP HFET-102 GaAs FET at 2GHz with a bias voltage $V_{gs} = 0$ are $S_{11} = 0.894 \angle -60.6^\circ$, $S_{12} = 0.020 \angle 62.4^\circ$, $S_{21} = 3.122 \angle 123.6^\circ$ and $S_{22} = 0.781 \angle -27.6^\circ$. $Z_0 = 50 \Omega$. Find the stability of this transistor with K- Δ and μ test values. Also find values for centers and radii of the stability circles. 4

END OF PAPER