

B.Tech IV Year II Semester (R15) Regular Examinations April 2019

**RF INTEGRATED CIRCUITS**

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 70

**PART – A**  
(Compulsory Question)

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- 1 Answer the following: (10 X 02 = 20 Marks)
- (a) Draw a series RLC tank circuit.
  - (b) Differentiate between series and parallel RLC networks.
  - (c) What is the range of reflection coefficient?
  - (d) A cascade of 8 identical amplifiers is connected in open circuit, each of which is single-pole with a 2 ms time constant. Find its bandwidth.
  - (e) For a 1 k $\Omega$  resistor at room temperature and a 10 kHz bandwidth, find the RMS noise voltage.
  - (f) Write a note on subsampling mixers.
  - (g) The average power delivered to the load is given as 10 W,  $P_{in} = 2$  W and  $P_{supp} = 4$  W, find the power-added efficiency of the power amplifier.
  - (h) Give the average current and average slope equation of PFD/CP circuit for an input phase difference of  $\Delta\phi \text{ rad} = [\Delta\phi/2\pi] \times T_{in}$ .
  - (i) With the phase noise  $-40\text{dBc}$  integrated over the range of 1 kHz to 100 kHz. Give the expression to convert it in to jitter.
  - (j) Mention some advantages of UMTS radio architectures.

**PART – B**  
(Answer all five units, 5 X 10 = 50 Marks)**UNIT – I**

- 2 Derive the expression for Q factor in an RLC network with a neat diagram and necessary equations.

**OR**

- 3 What is the role of resistors, capacitors and inductors in an RF system? Explain in detail.

**UNIT – II**

- 4 A slotted line measurement yields the following parameter values:
- (i) Voltage minima at 9.2 cm and 12.4 cm measured away from the load with the line terminated in a short.
  - (ii) VSWR = 5.1 with the line terminated in the unknown load; a voltage minimum is located 11.6 cm measured away from load. What is the normalized line impedance?

**OR**

- 5 Consider an AC-coupled system to estimate the low frequency -3dB point. Calculate that how large the coupling capacitors have to be to achieve a specified low-frequency breakpoint.

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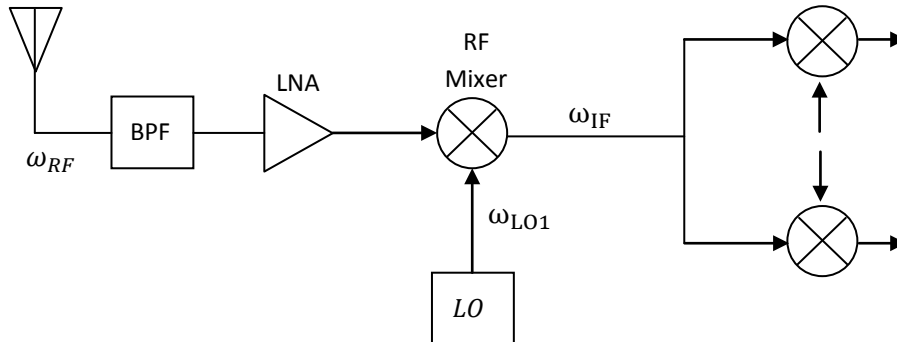
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**UNIT – III**

- 6 What are the parameters associated with intrinsic MOS noise? Explain in detail about each one of them with necessary equations.

**OR**

- 7 Discuss the noise behavior of the following receiver in two cases shown in figure given below:  
(i)  $\omega_{LO1}$  is far from  $\omega_{RF}$ .  
(ii)  $\omega_{LO1}$  lies inside the band.



**UNIT – IV**

- 8 Construct a tank consisting of lossy inductor and lossy capacitor. Determine the overall Q in terms of the quality factor of each.

**OR**

- 9 Plot the input / output characteristic of the XOR phase detector for two cases:  
(i) The circuit has a single-ended output that swings between 0 to  $V_{DD}$ .  
(ii) The circuit has a differential output that swings between  $-V_0$  and  $+V_0$ .

**UNIT – V**

- 10 Derive the expression for randomization and noise shaping in a fractional-N frequency synthesizers.

**OR**

- 11 Give a brief note on the following radio architectures:  
(a) Code Division Multiple Access.  
(b) Universal Mobile Telecommunication System.

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