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BIELE-004

B.Tech. – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

Term-End Examination

December, 2016

BIELE-004 : RF CIRCUITS

00273

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Missing data may be suitably assumed.*

1. (a) Explain the characteristics of passive IC components at RF frequencies.

   (b) What is the use of transmission lines in RF frequencies ? *2×5=10*

2. Derive the expression for input impedance of a transmission line. Also derive the expression for short and open circuit transmission line parameters. *10*

3. (a) Derive an expression for the Noise Figure using a two-port network.

   (b) Briefly explain the noise models that exist for active and passive components at RF frequencies. *2×5=10*

4. Give the electrical equivalent circuit representation of the following and explain the significance of the terms appearing in the equivalent circuit : *2×5=10*

   (a) High frequency capacitor

   (b) High frequency wire wound resistor

5. (a) What are the various topologies of Low Noise Amplifier ? Explain each of them briefly.

   (b) Explain the linearity and large signal performance of LNA. *2×5=10*

6. (a) Prove that the general expression for the amplifier efficiency (η) in terms of conduction angle (θ_0) is

$$\eta = \frac{\theta_0 - \sin\theta_0}{2\left[\theta_0 \cos\left(\frac{\theta_0}{2}\right) - 2\sin\left(\frac{\theta_0}{2}\right)\right]}.$$

   (b) What are the design parameters for high frequency amplifier design ? Explain in brief. *2×5=10*

7. (a) What is a negative resistance oscillator ? Describe its working principle. *5*

   (b) Differentiate between an oscillator and a synthesizer. *3*

   (c) What is the condition of oscillation of a circuit ? *2*

8. (a) What is the use of mixer ? Design a multiplier-based mixer circuit and explain its working principle.

(b) What is the difference between sub-sampling mixers and diode-ring mixers ? *2×5=10*

9. (a) Define RF power amplifiers and explain the operation of any one power amplifier with required expressions. *5*

(b) Explain the linearity considerations of RF power amplifiers. *3*

(c) Briefly explain the two-port stability criterion. *2*

10. Write short notes on any ***two*** of the following : *2×5=10*

(a) Resonators

(b) Neutralization and Unilateralization

(c) S-parameters

(d) f_T Doubler