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

Term-End Examination

00325　　　　**December, 2014**

BIELE-004 : RF CIRCUITS

Time : 3 hours　　　　　　　　　　*Maximum Marks : 70*

Note : *Attempt any **seven** questions. Missing data may be suitably assumed. All questions carry equal marks. Use of scientific calculator is allowed.*

1.　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 resistor

　　(b)　High-frequency wire-wound resistor

2.　Assuming that the dielectric and the conductor losses in a transmission line are small $(G \ll \omega_C$ and $R \ll \omega_L)$, show that the propagation constant K can be given as 　　　*10*

$$K = \alpha + j\beta = \frac{1}{2}\left(\frac{R}{Z_0} + GZ_0 \right) + j\omega \sqrt{LC}$$

where $Z_0 = \sqrt{L/C}$ is the characteristic impedance of line in the absence of loss.

3. Derive an expression for the noise-figure of a two-port network. *10*

4. What are the various topologies of low-noise amplifier ? Explain them in brief. *10*

5. Explain the operation of multiplier-based mixers with the help of diagrams. Support your answer with necessary mathematical expressions. *10*

6. Prove that the general expression for the amplifier efficiency (η) in terms of conduction angle (θ_0) is *10*

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

7. Draw the block-diagram representation of an oscillator and derive the expression for Barkhausen Criterion of oscillations. *10*

8. Explain the operation of combination synthesizers with the help of diagrams and necessary mathematical expressions. *10*

9. Define RF power amplifiers and explain the operation of any one power amplifier with required expressions. *10*

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

(a) Neutralization

(b) Unilateralization

(c) Synthesis with static moduli