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AQ–2790

Faculty of Engineering & Technology

M.E. Semester—I [Full Time] (Digital Electronics) (C.B.S.) Examination

RF SYSTEM DESIGN

Elective—I

Paper—1 UMEF 3

Sections—A & B

Time : Three Hours] [Maximum Marks : 80

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Answer **THREE** questions from Section A and **THREE** questions from Section B.

(3) Due credit will be given to neatness and adequate dimensions.

(4) Assume suitable data wherever necessary.

(5) Illustrate your answers wherever necessary with the help of neat sketches.

(6) Use pen of Blue/Black ink/refill only for writing the answer book.

SECTION—A

1. (a) Explain the frequency response of RF field effect transistors. 7

   (b) Explain the small signal BJT model. 7

2. (a) Explain the construction and functionality of High Electron Mobility Transistors. 7

   (b) For a particular Si pn-junction the doping concentrations are given to be $N_A = 10^{18}$ cm^{-3} and $N_D = 5 \times 10^{15}$ cm^{-3} with an intrinsic concentration of $n_i = 1.5 \times 10^{10}$ cm^{-3}. Find the barrier voltages for T = 300°K. 6

3. (a) Discuss a method used to convert lumped elements to transmission line sections. 7

   (b) Explain the design of class A power amplifier. 6

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4. (a) Explain Bandwidth enhancement in high frequency amplifier design. 7

(b) Explain the following related to filter implementation :

(i) Unit elements

(ii) Huroda's Identities. 6

SECTION—B

5. (a) Explain in brief single-ended LNA and differential LNA design. 6

(b) Explain the following characteristics of a mixer :

(i) Conversion gain

(ii) Noise figure

(iii) Linearity and isolation

(iv) Spurs. 8

6. (a) Explain linearity and large-signal performance in LNA. 7

(b) Explain dielectric resonator oscillator design. 6

7. (a) Explain noise properties of PLLs. 7

(b) Explain second-order PLL model. 6

8. (a) What are sequential phase detectors ? Hence, explain SR flip-flop as a phase detector. 7

(b) Explain the following related to PLL design :

(i) Loop filters

(ii) Charge pumps. 6

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