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Question Paper Code : 80109

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Second Semester

Medical Electronics

EC 8252 — ELECTRONIC DEVICES

(Common to Electronics and Communication Engineering/ Electronics and Telecommunication Engineering)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Determine the total forward bias current density in a PN junction diode under an applied forward bias voltage of 0.65 V at 300 K. Assume $J_S = 4.155 \times 10^{-11}$ A/cm^2.

2. Define Diffusion capacitance.

3. What is meant by "Early effect"?

4. State the "h" parameter equations for a NPN transistor under CE configuration.

5. Calculate the internal pinch off voltage of JFET with $a = 0.75\mu m$, $N_d = 10^6/cm^3$ $\varepsilon_r = 11.6$ and $\varepsilon_0 = 8.854 \times 10^{-12} F/m$.

6. Evaluate the body effect coefficient (γ) in a MOSFET with $N_a = 3 \times 10^{16}$/cm^3, $\varepsilon_r = 11.6$ and $\varepsilon_0 = 8.854 \times 10^{-12}$ F/m and $C_{ox} = 1.726 \times 10^{-7}$ F/cm^2.

7. Give the basic difference between JFET and MESFET.

8. What is meant by tunneling?

9. What do you understand by intrinsic standoff ratio in an UJT?

10. Define quantum efficiency in an LED.

PART B — (5 × 13 = 65 marks)

11. (a) From the basic concepts, derive an expression for the ideal PN junction current. (13)

Or

(b) (i) Enumerate the switching characteristics of the PN diode with suitable circuit and waveforms. (8)

(ii) Brief about break down mechanism in PN diodes. (5)

12. (a) Draw a circuit diagram to determine the CB characteristics of an NPN transistor. Also explain the input and output characteristics. (13)

Or

(b) Outline the Ebers – Moll model of a NPN transistor with necessary circuit and relevant equations. (13)

13. (a) (i) Explain the construction of an N channel FET with a diagram. (5)

(ii) Derive an expression for pinch off voltage in FET. (8)

Or

(b) (i) Discuss the structure of an N channel depletion type MOSFET with a neat diagram. (5)

(ii) Describe the output and transfer characteristics of MOSFET. (8)

14. (a) (i) Illustrate the operation of a MESFET with energy band diagram and space charge regions. (8)

(ii) Deduce the expression for current voltage relation in a Schottky barrier diode. (5)

Or

(b) Explain the Principle of tunnel diode with necessary band diagrams. Also illustrate the V-I characteristics and the negative resistance Phenomenon. (13)

15. (a) Enumerate the Structure of a SCR. With a two transistor model derive an expression for anode current (I_A). Also indicate its V-I characteristics. (13)

Or

(b) Outline the theory of light generation in light emitting diode, with necessary expressions for internal and external quantum efficiencies. (13)

PART C — (1 × 15 = 15 marks)

16. (a) An indicator requires Voltage to be displayed in seven segment format. However, the power requirement for the display should be very low. Choose a proper display device and justify your choice. Also indicate the characteristics and operating principle of such a display device. (15)

Or

(b) How do you modify the structure of a simple BJT to operate it for 250 V and 7 A? Discuss the characteristics of such a device and identify its limitations. (15)