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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)

- 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/cm².
- Define Diffusion capacitance.
- What is meant by "Early effect"?
- State the "h" parameter equations for a NPN transistor under CE configuration.
- Calculate the internal pinch off voltage of JFET with $a = 0.75 \mu\text{m}$, $N_d = 10^6 / \text{cm}^3$, $\epsilon_r = 11.6$ and $\epsilon_0 = 8.854 \times 10^{-12}$ F/m.
- Evaluate the body effect coefficient (γ) in a MOSFET with $N_a = 3 \times 10^{16} / \text{cm}^3$, $\epsilon_r = 11.6$ and $\epsilon_0 = 8.854 \times 10^{-12}$ F/m and $C_{ox} = 1.726 \times 10^{-7}$ F/cm².
- Give the basic difference between JFET and MESFET.
- What is meant by tunneling?
- What do you understand by intrinsic standoff ratio in an UJT?
- 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)

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