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**B.TECH**  
**(SEM III) THEORY EXAMINATION 2017-18**  
**ELECTRONIC DEVICES AND CIRCUITS**

Total Marks: 70

Time: 3 Hours

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

1. Attempt *all* questions in brief.

- Mention the advantages of negative feedback.
- What do you mean by Base Width Modulation in BJT.
- What is fluorescence?
- How does direct recombination lifetime differ from indirect recombination lifetime?
- Brief the Avalanche breakdown mechanism.
- Differentiate EMOSFET with DMOSFET
- Find the current gain  $\beta$  in CE configuration of BJT, if  $\alpha = 0.98$ .

**SECTION B**

Q.2 Attempt any three of the following (7x3=21)

- Draw the CE amplifier with a resistance connected in Emitter and derive the expression for different characterizing parameters.
- Discuss the various internal capacitances for BJT and MOSFET.
- Explain the phenomenon of luminescence. What are its different types? How does fluorescence differ from phosphorescence? Discuss its application as a fluorescence lamp.
- What is Einstein relation? Develop an expression to establish relation between diffusion coefficient & mobility of carriers.
- Boron is implanted in to a n- type Si sample having donar concentration of  $10^{16}/\text{cm}^3$ , to form abrupt junction. If the acceptor concentration in P-type region is  $4 \times 10^{18}/\text{cm}^3$ , determine the
  - Width of the depletion region
  - depth of penetration on n-side & p-side at equilibrium. Take room temperature as  $27^\circ\text{C}$ ;  $n_i = 1.5 \times 10^{10}/\text{cm}^3$  & relative permittivity of boron as 11.8.

**Section C**

Q.3 Attempt Any one part of the following (7x1=7)

- Draw the four basic feedback topologies. Compare the Input and output resistance among the feedback topologies.

- (b) Explain the working of common source amplifier with a resistance is connected in source

Lead. Draw its small signal equivalent circuit. Deduce the expression for overall voltage gain.

Q.4 Attempt Any one part of the following

(7x1=7)

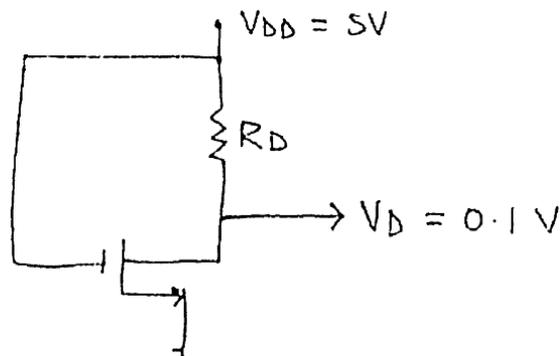
- (a) Differentiate between direct and indirect band gap semiconductor. Also discuss the variation of energy band with alloy composition.

(b) What do you mean by Fermi level? Discuss the effect of temperature & doping on mobility. A Si sample is doped with  $10^{17}$  As atoms/cm<sup>3</sup>. What is the equilibrium hole concentration on Po at 300K? Where is  $E_F$  relative to  $E_i$ .

Q.5 Attempt Any one part of the following

(7x1=7)

- (a) Design the circuit shown in the fig to establish a drain voltage of 0.1V what is the effective resistance between drain and source at this operating point? Let  $V_t = 1V$ , and  $K_n(W/L) = 1mA/V^2$ .



- (b) Construct P channel enhancement MOSFET. Draw and explain the I-V characteristics when  $V_{DS}$  is increased.

Q6 Attempt Any one part of the following

(7x1=7)

- (a) How BJT can be used as a amplifier and as a switch? Justify using required circuit, waveform, mathematical expression.

(b) Mention the different biasing technique used in BJT. Explain any two of them.

Q7 Attempt Any one part of the following

(7x1=7)

- (a) Draw the high frequency hybrid- $\pi$  model of MOSFET. and Show that  $f_T = g_m / 2\pi(C_{gs} + C_{gd})$

(b) Mention the conditions for oscillation. Derive the expression for frequency of oscillation in Phase shift Oscillator.