Total No. of printed pages = 4

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ET 131305

Roll No. of candidate | | | | | | | | | | |

2019

B.Tech. (EE) 3rd Semester End-Term Examination

ANALOG ELECTRONICS

(New Regulation)

(W.e.f. 2017 – 2018)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Answer ALL the questions : (10 × 1 = 10)

   (i) What is the current gain for CB configuration when $I_E = 4.2$ mA and $I_C = 4$ mA?

   (ii) What do you mean by loop gain of feedback in amplifers?

   (iii) An ideal op-amp has

   (a) infinite output resistance

   (b) zero input impedence

   (c) infinite band width

   (d) all the above

   (iv) What is dynamic resistance of a diode?

   (v) Why Emitter of a transistor is heavily doped?

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(vi) In a feedback amplifier, sensitivity is equal to :

(a) $A\beta$

(b) $1 - A\beta$

(c) $1 + A\beta$

(d) $1/(1 + A\beta)$

(vii) Which capacitance dominates in the forward bias region?

(a) diffusion

(b) transition

(c) depletion

(d) none of the above

(viii) Define Fermi level.

(ix) The reverse current in a diode is of the order of _____.

(a) kA

(b) mA

(c) A

(d) μA

(x) In a transistor, the base current is about _____ % of emitter current.

Answer any FOUR questions $(4 \times 15 = 60)$

2. (a) What is Fermi Dirac distribution function. Draw the graph explaining Fermi distribution for different temperature. Also explain the effect of temperature variation on Fermi level in a semiconductor. (5)

(b) In a P type semiconductor the Fermi level lies 0.4 ev above the valence band. If the concentration of acceptor atom is tripled , find the new position of Fermi level. Assume KT = 0.03 ev. (5)

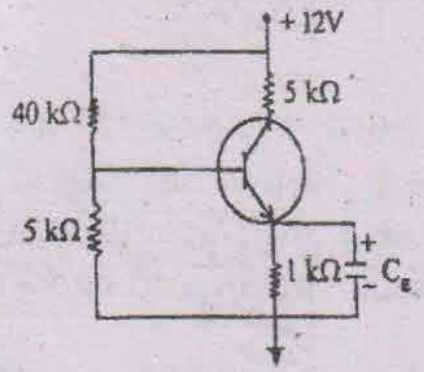
(c) Define drift and diffusion current in a semiconductor. Find the total current density in a semiconductor. (5)

3. (a) Reverse saturation currents of two diodes are measured and it is observed that I_O for D_1 is 15 nA while that for D_2 is 4 μA. Identify which diode is made of Si and which one is made of Ge. In the Ge diode calculate current when a forward bias of 0.6 V is applied. Assume room temperature = 27°C. (5)

(b) Explain the formation of the depletion region in p-n junction diode with the derivation of the depletion width. (10)

4. (a) Why the stability of Q point is necessary? What are the causes of instability of a Q point? (5)

(b) In a transistor circuit find the operating point if β = 100. Make use of Thevenin's theorem to find Out accurate values of I_C and V_{CE}. (5)



(c) Write the Ebers Moll equations. Sketch the circuit which satisfies these equations. (5)

5. (a) An amplifier has voltage gain with feedback of 100. If the gain without feedback changes by 40% and the gain with feedback should not vary more than 8%, determine the value of open loop gain and feedback ratio. (5)

(b) Derive the voltage gain, input resistance and output resistance for the following topologies. (10)

(i) voltage series feedback

(ii) voltage shunt feedback.

6. (a) Define the following terms in connection with an op-amp – CMRR, slew rate, input offset voltage, output offset voltage, input biased current. (5)

(b) Write ideal characteristics of op-amp. Draw the voltage transfer graph of op-amp. (5)

(c) Indicate a op-amp connected as : (5)

(i) Subtractor

(ii) Differentiator

For each case get the relevant expression for V_O.

7. (a) Draw the circuit diagram of a transistor in CE configuration. Draw the input characteristics and also sketch output characteristics .Indicate the active, saturation and cut – off regions. (5)

(b) In a BJT, I_C = 10 mA, I_B = 50 μA, Find β_{dc}, α_{ac}. Neglect I_{CBO}. Derive the relationship between α, β and γ for BJT. (5)

(c) Explain Avalanche and Zener breakdown. (5)
