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B TECH
(SEM. IV) THEORY EXAMINATION 2017-18
ELECTRONIC CIRCUITS

Time: 3 Hours   *Total Marks: 100*

Note: 1. Attempt all Sections.
2. Assume any missing data.

SECTION A

1.   Attempt *all* questions in brief.   2 x10 = 20

a. A differential amplifier has inputs V_1 = 10mV and V_2 = 9mV. It has a differential mode gain of 60dB and a CMMR of 80dB. Find the percentage error in the output voltage and the error   voltage.

b. What do you mean by voltage follower circuit? Explain in brief.

c. How MOSFET works as a switch and amplifier.

d. Explain the difference between DMOSFET & EMOSFET.

e. A BJT having β = 100 is biased at a dc collector current of 1 mA. Find the value of g_m and r_e.

f. Find out the relationship between α, β and γ.

g. Draw the current mirror circuit and write its output current equation.

h. What are the advantages of using an active load in differential amplifier circuit?

i. Explain the Barkhausen criterion for oscillator.

j. What are the advantages and disadvantages of negative feedback.

SECTION B

2.   Attempt any *three* of the following: 10 x 3 = 30

a. What are the characteristics of the ideal Op-Amp? Explain the concept of virtual ground. Design a noninverting amplifier with a gain of 2 at the maximum output voltage of 10V the current in the voltage driver is to be 10 μA.

b. A MOSFET is to operate at I_D = 0.1 mA and is to have $g_{m=}$1 mA/V. If K'_n= 50μA/V^2. Find the required W/L ratio and the overdrive voltage.

c. Write the steps through which small signal equivalent circuit model can be used in the analysis of transistor amplifier.

d. Design and explain the working of a differential amplifier using active load circuit in detail.

e. Explain the working of a Phase Shift oscillator. Derive an expression for the frequency of oscillations. What are the merits and demerits of such oscillator?

SECTION C

3. Attempt any one parts of the following: 10 x 1 = 10

a. (i) Draw the schematic diagram of an instrumentation using op amp and explain its working.

(ii) What do you mean by Integrator? Derive the expression for output voltage.

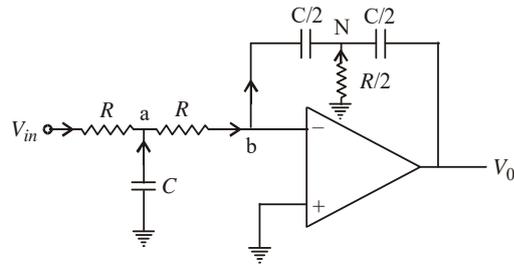b. (i) For the circuit shown in figure-1, obtain the transfer function.

Figure 1

(ii) Derive the formula for negative feedback amplifier gain in terms of A_f, A & β

4. Attempt any one parts of the following: 10 x 1 = 10

  a) Draw and explain depletion type N-MOSFET with its characteristics

  b) Draw the circuit diagram of biasing the MOSFET using a constant-current source and calculate the expression for I in terms of I_{REF}.

5. Attempt any one parts of the following: 10 x 1 = 10

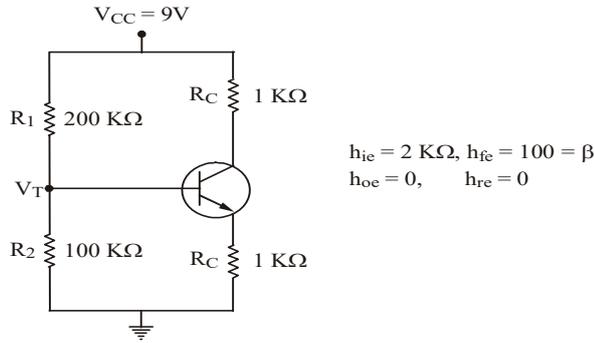 a) Find the collector current and collector-emitter voltage for the circuit shown in figure-2.

Figure 2

  b) Draw the circuit diagram of single stage CE amplifier, implement hybrid-π model for it and calculate expressions for gain, input/output impedance, i_e, g_m and i_b.

6. Attempt any one parts of the following: 10 x 1 = 10

  a) Find the Q-point, V_c and I_B for the differential amplifier shown in Figure-3.
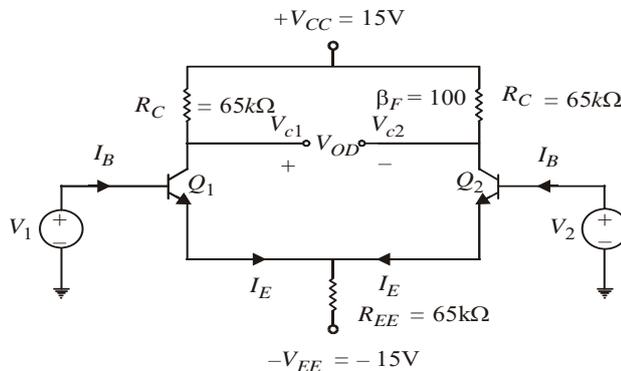

Figure 3

  b) Do the small signal analysis of MOS differential pair to determine differential and common mode gain.

7. Attempt any one parts of the following: **10 x 1 = 10**

a) Distinguish current feedback and voltage feedback with appropriate circuit /block diagram.

b) (i) Draw the circuit diagram of a Wien-bridge oscillator and derive an expression for the frequency of oscillations.

(ii) In colpitts oscillator using FET, the frequency of oscillations is observed to be 2.5MHz oscillator uses: $L=10\mu H$, $C_1=.02\mu f$. Find (i) value of C_2 (ii) If L is doubled, the new value of freq. of oscillations.