



(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 130401

Roll No.

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B. Tech.

(SEM. IV) THEORY EXAMINATION, 2014-15 ELECTRONICS CIRCUITS

Time : 3 Hours]

[Total Marks : 100

- Note :**
- (1) Attempt all questions.
 - (2) All questions carry equal marks.

1 Attempt any four parts of following : 5×4=20

- (a) Derive an expression for the voltage gain, v_o/v_i of the circuit in the Figure 1.1

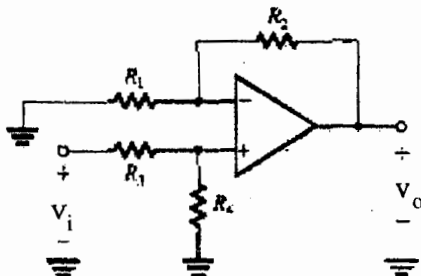


Figure 1.1

- (b) Discuss how the performance of an OP-AMP is affected by the open loop gain of amplifier.

- (c) Describe the difference between inverting and non-inverting amplifier.
- (d) Derive an expression for the input resistance of the inverting amplifier of the Figure 1.2 taking into account the finite open loop gain A of the OP-AMP.

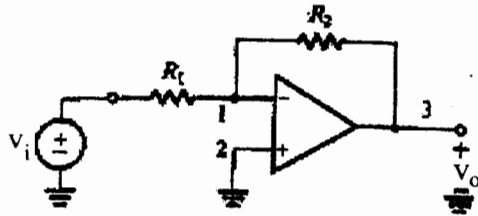


Figure 1.2

- (e) For an amplifier having a slew rate of $60 \text{ V}/\mu\text{s}$, what is the highest frequency at which a 20-V peak-to-peak sine wave can be produced at the output?
- (f) What are the ideal characteristics of op-amp? Explain the concept of voltage follower.

2 Attempt any four parts of following : 5×4=20

- (a) Discuss the i_D - V_{DS} characteristics of n-channel enhancement type MOSFET. Indicate the three distinct regions of operation.
- (b) For a particular MOSFET operating in the saturation region at a constant v_{GS} , i_D is found to be 2 mA for $v_{DS} = 4 \text{ V}$ and 2.2 mA for $v_{DS} = 8 \text{ V}$. What values of r_0 , V_A , and λ correspond?
- (c) What is bias stabilization? Explain the basic current mirror with suitable diagram.
- (d) For the CS amplifier, determine its high frequency transfer function.

- (e) The bias circuit of Figure 2.1 is used in a design with $V_0 = 5 \text{ V}$ and $R_s = 1 \text{ k}\Omega$. For an enhancement MOSFET with $k'n(W/L) = 2 \text{ mA}/\text{V}^2$, the source voltage was measured and found to be 2 V. What must V_t be for this device? If a device for which V_t is 0.5 V less is used, what does V_s become? What bias current results?

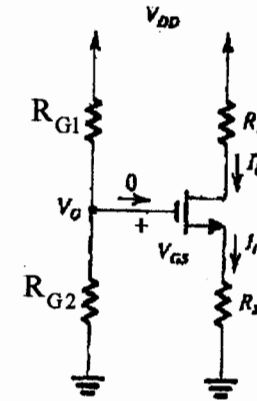


Figure 2.1

- (f) Draw the high frequency model of MOSFET and explain the MOS capacitances.
- 3 Attempt any two parts of following: 10×2=20
- (a) Why transistor action cannot be achieved by connecting two diodes back to back. Explain input and output characteristics of Common emitter BJT.
- (b) A *pn*p transistor operates with an emitter-to-collector voltage of 5 V, an emitter current of 10 A, and $V_{EB} = 0.85 \text{ V}$. For $\beta = 15$, what base current is required? What is I_s for this transistor? Compare the emitter-base junction area of this transistor with that of a small-signal transistor that conducts $i_c = 1 \text{ mA}$ with $V_{EB} = 0.70 \text{ V}$. How much larger is it?

- (e) What is emitter stabilization in self-bias circuit of an npn transistor in CE amplifier? Explain the high frequency response of common emitter amplifier.

4 Attempt any two parts of following : **10X2=20**

- (a) Explain the small signal operation of BJT differential pair and derive the expressions for differential input resistance and gain.
- (b) Explain CS MOS differential pair and discuss the non ideal characteristics of MOS differential pair.
- (c) Calculate the output resistance and CMRR for active loaded BJT differential pair.

5 Attempt any two parts of following : **10×2=20**

- (a) Draw a neat sketch of a generalized resonant circuit oscillator using three impedances. Explain
- Hartley oscillator and derive the frequency of oscillation.
- (b) Define the Barkhausen criterion for oscillation. Derive an expression for frequency of oscillation of Wein bridge oscillator.
- (c) Discuss the effect of negative feedback on noise and Bandwidth of an amplifier. Calculate the gain, input resistance and output resistance of trans-resistance amplifier.
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