Printed Pages : 4

EC401(MTU)

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

PAPER ID : 130401

Roll No.

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

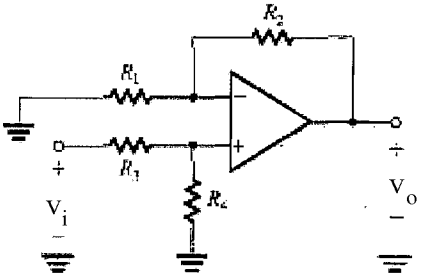

Figure 1.1

(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 Figure1.2 taking into account the finite open loop gain A of the OP-AMP.

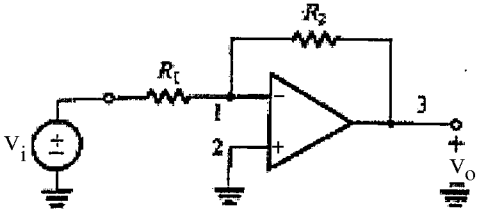

Figure 1.2

(e) For an amplifier having a slew rate of 60 V/μs, 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 V and 2.2 mA for v_{DS} = 8 V. What values of r_0, V_A, and λ correspond?

(e) 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 V and R_s = 1 kQ. For an enhancement MOSFET with k'n(W/L) = 2mA/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?

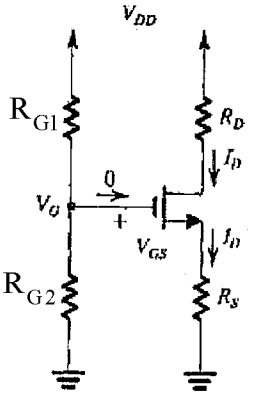

Figure 2.1

(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 *pnp* transistor operates with an emitter-to collector voltage of 5 V, an emitter current of 10 A, and V_{EB} = 0.85 V. For β = 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 mA with V_{EB} = 0.70 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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