

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

Paper ID : 131406

Roll No.

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B.TECH.

Theory Examination (Semester-IV) 2015-16

ELECTRONIC CIRCUITS

Time : 3 Hours

Max. Marks : 100

Section-A

Q1. Attempt all parts. All parts carry equal marks.

(10×2=20)

- (a) What do you mean by voltage follower circuit ? explain in brief.
- (b) Why Op Amp is rarely used in open loop configuration?
- (c) What is Barkhausen criteria for sinusoidal oscillations
- (d) Draw the current mirror circuit and write its output current equation.
- (e) State the properties of negative feedback.
- (f) What are the advantages of using an active load in differential amplifier circuit?
- (g) What are the types of feedback ?

- (h) Draw the Small signal π Model of BJT.
- (i) How does the slew rate effects Finite or Full power Band Width of Op Amp ?
- (j) An enhancement type NMOS transistor with $V_t = 0.7V$ has its source terminal grounded and a 1.5V dc applied to the gate. In what region does the device operate for $V_D = 0.9V$.

Section-B

Q2. Attempt any five questions from this section. (10×5=50)

- (a) Discuss the effect of finite loop gain on the performance of non-inverting OP-AMP.
- (b) A MOSFET is to operate at $I_D = 1mA$ and is to have $g_m = 1 mA/V$. If $K_n = 50 \mu A/V^2$. Find the required W/L ratio and the overdrive voltage.
- (c) Draw the high frequency model of MOSFET and derive an expression of f_H .
- (d) BJT transistor amplifier stage has $R_E = R_C = 1.5k\Omega$, $R_S = 6000\Omega$, $R_L = 2k\Omega$ and transistor parameter as $\beta = 100$ and $r_\pi = 1k\Omega$. Determine the value of C_{C1} , C_{C2} and C_E needed to obtain $f_L = 50Hz$ and also draw the circuit.
- (e) Explain the operation of BJT as a switch and as an amplifier.

- (f) Explain the Nonideal characteristics of MOS differential pair.
- (g) Draw a circuit diagram of Wein bridge oscillator and drive an expression of frequency of oscillation. Calculate the frequency of oscillation for given values of $R_1=R_2=200\text{K}\Omega$, $C_1=C_2=200\text{pF}$.
- (h) Design the circuit shown in fig.1 so that transistor operates at $I_D = 0.4\text{mA}$ and $V_D = +0.5\text{V}$. The NMOS transistor has $V_t = 0.7\text{V}$, $\mu_n C_{ox} = 100\mu\text{A}/\text{V}^2$, $L = 1\mu\text{m}$ and $W = 32\mu\text{m}$. Neglect the channel length modulation.

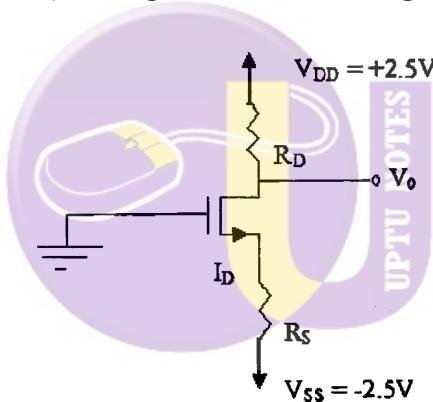


Fig. 1

Section-C

Note: Attempt any two questions from this section. (15×2=30)

- Q3. (a) Draw Instrumentation Amplifier. How does it improve the performance parameters of an Op Amp?

- (b) Define slew rate and show how it is related to full power bandwidth. An op-amp has a rated output voltage $\pm 10\text{V}$ and slew of rate of $1\text{V}/\mu\text{s}$. What is its full power band width.

Q4. (a) Consider the common emitter circuit using a BJT having $I_S=10^{-15}\text{A}$. A collector resistance $R_C=6.8\text{K}\Omega$ and power supply $V_{CC}=10\text{V}$.

- (i) Determine the value of bias voltage V_{BE} required to operate the transistor at $V_{CE}=3.2\text{V}$. what is the corresponding value of I_C .

- (ii) Find the voltage gain A_V at this bias point.

- (iii) If the input sine wave of 5mA peak amplitude is superimposed on V_{BE} . Find the amplitude of output sine wave signal.

- (b) Draw the circuit for CB amplifier and find expression for short circuit gain.

Q5. (a) Draw the T equivalent circuits of common source amplifier with a source amplifier with a source resistance and obtain the expressions for R_{in} , R_{out} , and G_v .

- (b) An inverting amplifier has feedback resistor $R_2=500\text{K}\Omega$ and $R_1=5\text{K}\Omega$. Find the amplifier circuit voltage gain, input resistance and output resistance. Also find the output voltage and input current if the input voltage is given as $.1\text{ volts}$. Assume the OP-AMP to be an ideal one.