B.E.Degree Examinations, Nov 2011

Electronics and Communication Engineering

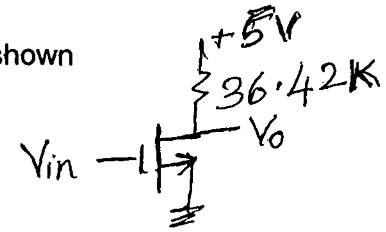
EC 9202- Electronic Circuits I   Reg-2008

III Semester Full Time

Time : 3 Hours   **Answer All Questions**   **Max.marks: 100**

PART-A   **(10x 2 = 20 marks)**

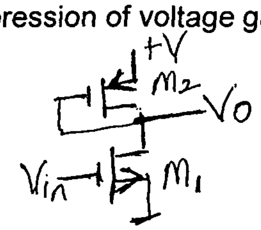
1. Define Noise margin in logic inverter .
2. Briefly explain thermal stability.
3. Define CMRR of a differential amplifier .
4. Define class C operation and draw a class C power amplifier.
5. What is meant by body effect and how it is taken care in MOSFET analysis .
6. Find the aspect ratio of NMOS inverter shown



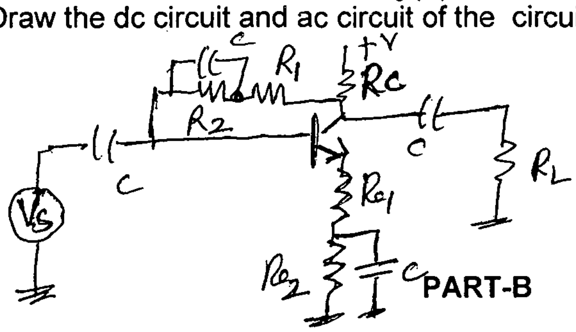
$\mu_n C_o = 80\mu A/V^2$
$V_t = 0.8V$

7. A CE amplifier without feedback has h_{fe} = 212, h_{ie} = 5.6K, R_s = 3.2K, R_c = 10K, R_L=7.8K C_{be} =21pf, C_{bc} =3.7pf and wiring capacitance =4pf .Find the total capacitance at input and output ports of the amplifier.

8. Write the expression of voltage gain of circuit shown .



9. Design a JFET self bias circuit to have V_{gsQ}= - 2 V, I_{DQ}= 2mA and V_{DSQ}=6V.Assume V_{DD} =12 V $V_{gs(off)}$ = - 4 V and I_{DSS} = 8mA .
10. Draw the dc circuit and ac circuit of the circuit shown.

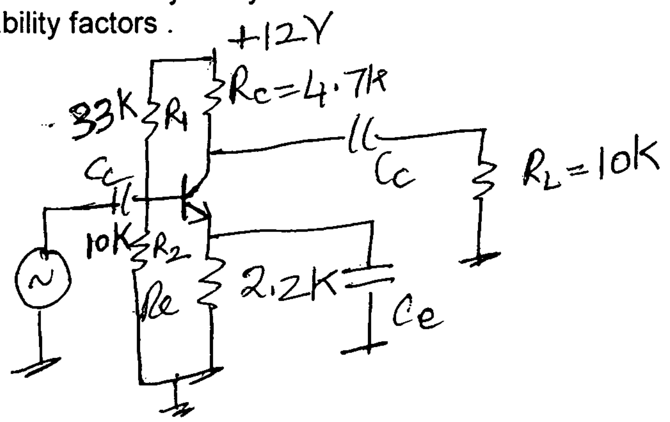


PART-B   **(5 x 16 = 80 marks)**

11(i) Locate the operating point by drawing the dc and ac load lines of the circuit Shown in Fig.(1) , also find the maximum power delivered to the load R_L . **(8)**

(ii) Perform stability analysis of collector to base circuit and hence derive for all stability factors . **(8)**

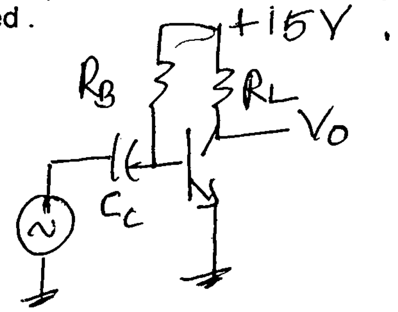
Fig 1



hfe=200

12(a)(i) Explain class B power amplifier with circuit diagram. Derive for its efficiency, also find for what fraction of input signal ,power dissipation is maximum. **(10)**

(ii) Design a class A power amplifier shown to deliver ac power to R_L =300Ω at an efficiency of 16%. Calculate the input power, ac power output and power dissipated . **(6)**

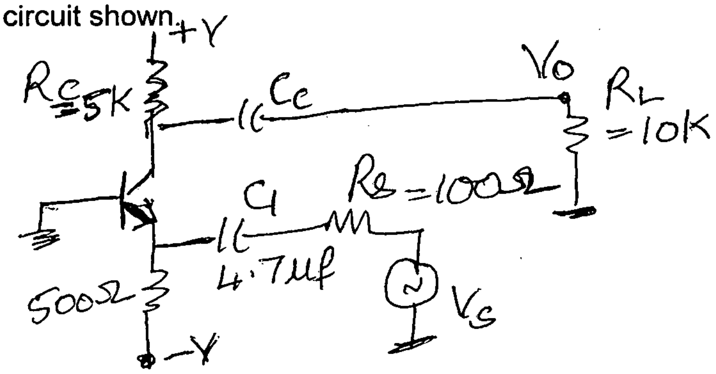


$h_{fe} = 60$

(OR)

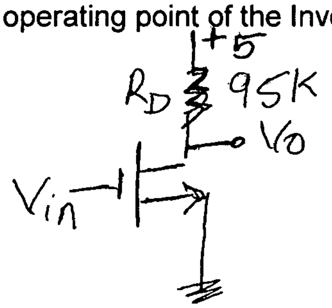
(b)(i) Define f_α and f_β .Derive for f_α and f_β **(6)**

(iii) Calculate the Midbad gain ,lower cut off frequencies, higher cutoff frequencies for the circuit shown. **(10)**



$C_{be} = 35pf$
$C_{bc} = 4pf$
$h_{fe} = 150$
$h_{ie} = 3.82K$

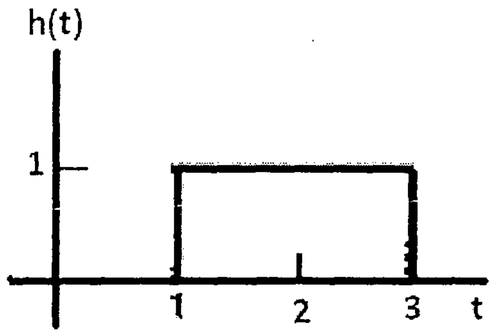
13 (a)(i) For the NMOS inverter shown, calculate the noise margin in high and low state. Draw the VTC of the inverter indicating the points V_{IL} , V_{IH} ,V_{OL} and V_{OH} Also mark the operating point of the Inverter in ON and OFF states. **(10)**

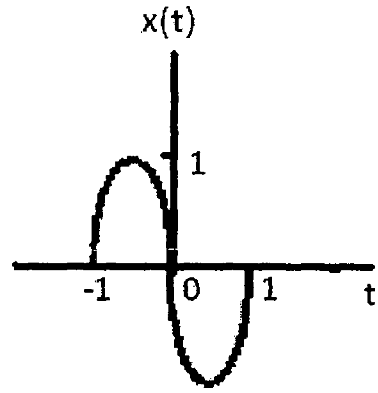


$\mu_n C_o = 25 \mu A/V^2$
$V_t = 1V$
$\frac{W}{L} = \frac{2.06}{1}$

(ii) Draw a BIMOS cascode amplifier and its equivalent circuit. Derive the expression for its A_V **(6)**

(OR)





(ii). The input and output of an LTI system is described by the following differential equation

$$\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6 = 2x(t)$$

Determine the impulse response of the LTI system. What is the response of the system if the input to the system is given by $x(t)=te^{-3t}u(t)$. (8)

(OR)

(b) (i)Consider a causal LTI system with transfer function $H(s)=\frac{1}{s^2+2s+2}$. Let the input x(t) to the LTI system is given by $x(t)= e^{-3t}u(t)$. Determine the response y(t) and impulse response h(t). (8)

(ii) Consider an LTI system with an impulse response $h(t)=te^{-3t}u(t)$ and an input x(t) defined by $x(t)=te^{-4t}\ u(t)$. Use fourier transform to determine the frequency response $Y(j\omega)$ and the response y(t). (8)

14. (a) (i).The spectrum $X(j\omega)$ of a bandlimited signal x(t) is shown in the figure below. Determine and plot the spectrum of sampled signal if the signal is sampled at the rates (1) $\omega_s = 4\omega_m$ and (2) $\omega_s = 0.5\omega_m$. (8)

(ii). Determine the signal corresponding to the Fourier transform given by

$$X(e^{j\omega})=\sum_{k=-\infty}^{\infty}(-1)^k\delta(\omega - \tfrac{\pi}{4}k)$$ (8)

(OR)

(b) (i).Consider the signal x[n] given below. Determine its z-transform X(z), draw the ROC and mark the poles. (8)

$$x[n]=\begin{cases} \left(\frac{1}{5}\right)^n \cos\left(\frac{\pi}{8}n\right), & n \le 0 \\ 0 & , n > 0 \end{cases}$$

(ii). Determine the Fourier transform of the signal x[n] given by (8)

$$x[n]=\begin{cases} n\,, -4 \le 0 \le 4 \\ 0\,, otherwise \end{cases}$$

Q15. (a)(i).Consider an LTI system with impulse response $h[n]=\frac{\sin(\frac{\pi n}{4})}{\pi n}$. Determine the response y[n] for the input x[n] defined by $x[n]=\delta[n+2] + \delta[n-1]$ by computing the Fourier transform. (8)

(ii). Consider a discrete time LTI system with impulse response $h[n]=\left(\frac{1}{4}\right)^n u[n]$. Use Fourier transform to determine the response y[n] for the input signal $x[n]=(-1)^n$. (8)

(OR)

(b)(i). Determine whether an LTI system described by the transfer function $H(z)=\frac{z-\frac{1}{4}}{z^2+\frac{2}{3}z+\frac{1}{9}}$ is causal and/or stable without computing z transform. State with proof. (8)

(ii). Consider a causal LTI system whose input x[n] and output y[n] are related by

3y[n-2] + 4y[n-1] + 4y[n]=x[n]. Determine system transfer function H(z). Using H(z), determine the step response of the given causal LTI system. (8)