1) BIMOS SCHMITT TRIGGER 4 pts
   BJT -- VBE(on) = 0.7V, VBE(cut in)=0.5V, VCE(sat)0.2V
   FET -- VT = 4V, K = 1mA/V^2, IDS = K(VGS-VT)^2 (sat)
   a) Find VILTP 1 pt
   b) Find VS (when Q1 is off and Q2 is saturated) 1 pt
   c) Find VOL 1 pt
   d) Find VIUTP (assume VBE1 will cut in at 0.5 V) 1 pt

   ![Diagram](image)

   \[ Q_1 = \text{BJT} \]
   \[ Q_2 = \text{FET} \]

2) BJT Schmitt Trigger 4 pts
   VIUTP=2.7V, VBE(on)=.7V; VBE(cut-in)=0.5V; B=\infty
   a) Find R2 for the given VIUTP. 1 pt
   b) With Q1=on, Q2=off: Find the exact value of IE and I2 in terms of VILTP and the values for VBE(on), VBE(cut-in),R1,R2,RC1 & RE. 1 pt
   c) Find VILTP by solving for the voltage across RC1. 1 pt.
   d) Find VOL, VOH. 1 pt.

   ![Diagram](image)
3) BJT Schmitt Trigger Circuit. 3 pts.
   a) Find $V_i$(Lower Trigger Point) 2 pts.
   b) Find $V_i$(Upper Trigger Point) 1 pt.
   *Neglect Base currents.*
4. For the FET Schmitt Trigger shown: 6 pts
VT=1V; K=1mA/V²; IDS=K(VGS-VT)²; Vs=1V @ Vi=VILTP
N channel enhancement in sat mode when on.
   a) What is IDS1 @ VILTP.  1 pt
   b) Find VILTP. 1 pt.
   c) Find VOH.  1 pt
   d) Find VIUTP. 1 pt
   e) Find VOL.  1 pt
   f) Plot the transfer fcn curve Vo as a fcn of Vi.  1 pt

5. OP-AMP WAVEFORM SHAPER 4 pts.
For the following circuit:
   R1=10K; R2=100K; VF(D1)=0.7V; VBB=5V; Vi = 1Hz sine wave
   amplitude of 1 volt.
   a) Plot node 1 vs. time for the applied input voltage.  1 pt
   b) On one page plot Vo vs. time, below Vi vs. time, for at least one
      cycle. Show voltage levels.  2 pt
   c) Determine the value of R3 to DC null the output.  1 pt
6) For the BJT Schmitt Trigger shown: $VI_{UTP} = 2.7V$, $VBE(sat) = 0.7V$, $V_{BE}$(cut in) = 0, B =

![Schmitt Trigger Circuit Diagram]

- Find $R_2$ for the given $VI_{UTP}$. 1 pt
- With $Q_1$=on, $Q_2$=off: Find $I_E$ and $I_2$ in terms of $V_{ILTP}$ and ckt R's. 1 pt
- Find $V_{ILTP}$ by solving for the voltage across RC1. 1 pt.
- Find $V_{OL}$, $V_{OH}$. 1 pt.
- Plot the transfer function $V_o$ as a function of $V_i$. 1 pt.

7) Find $V_{1(Upper Trigger Point)}$ and $V_{1(Lower Trigger Point)}$ for the BJT Schmitt trigger circuit.

![Additional Circuit Diagram]
Op Amp Schmitt Trigger

\[ V_{o(max)} = 10V, \quad V_{o(min)} = -10V, \quad V_f = 0.7V (D1) \]

a) Find \( V_{iLTP} \) 5 pts.
b) Find \( V_{iUTP} \) 5 pts.
c) Plot the transfer fcn. \( V_o \) vs \( V_i \) 5 pts.
d) Plot \( V_o \) vs time, show all voltage levels 5 pts.
e) Plot \( V_o \) vs time, show all voltage levels 5 pts.

An Op-amp Schmitt trigger circuit is shown: \( R_o = 0, \quad R_i = \infty \), \( V_{o(max)} = 10V, \quad V_{o(min)} = -10V \)
a) Find the \( V_{iUTP} \) 1 pt.
b) Find the \( V_{iLTP} \) 1 pt.
c) Plot the Voltage Transfer Characteristic (\( V_i \) vs \( V_o \)) for \(-5V < V_i < 5V\). 1 pt.
d) Plot the output voltage, \( V_o \) for \( V_i = 5 \cos t \). 2 pt.
SCHMITT TRIGGER EMPLOYING COMPARATOR  

a) Determine VILTP and VIUTP 1 pt
b) Determine VOH 1 pt
c) Plot the transfer curve of Vo vs Vi. 1 pt

RL=2K; R1=3K; R2=5K

Comparitor output values: Vo'(high)= High Z; Vo'(low)= GROUND

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PULSE CIRCUITS 444 FALL 91 TEST 2 PUT NAME and S.N. on BLUE BOOK !!

Op Amp Schmitt Trigger 5 pts.
Vo'(max)=10V; Vo'(min)=-10V; Vf=0.0V

a) Find VILTP 2 pts.
b) Find VIUTP 2 pts.
c) Plot the transfer fcn. Vo vs Vi. 1 pt.