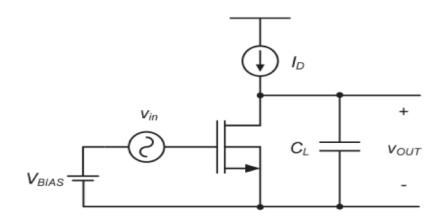
2. Design the following intrinsic gain stage using the 180nm PTM to have the following specs.



- a. Av = 60
- b. GBW = 250 MHz
- c. CL = 1 pF

Spees $DOF$	1		Degrees of	freedom -
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			V	
$CL \implies IPF \qquad IB \qquad ?$ $CDW = f_{U}(UGF) \qquad Uin and ID \qquad O Vent$ $= Gain \times BW \qquad ID \qquad I$	X	Gain > 60		
GBW $\simeq$ $f_{u}$ (UGF)  = Grien X BW  = Grie	6Bu	U → 250 NHZ	L	?
$68w \simeq f_{u} (U6f)$ $= Gain \times Bw$ $= Gm   Gas \times 1                                  $	CL	⇒ i PF	$I_{\mathcal{B}}$	?
$6BW \simeq f_{W} (UGF)$ $= Gain \times BW$ $= Gm   Gast \times                                   $	Larra P	Life make the life	T makel	
= Sun x BW  = Sun last x   _ = Sun  2TT lost Q ZUQ  Om = GBW. 2UQ = 1.57 ms   Let Sun = 5			(J) IB	
= Gian X BW  = Gia	6BW	$\simeq f_{u}(v_{6}f)$		o Vaut
= Sun & BW  = Sun Road x   Sun  211 load Q ZUQ  Om = GBW. 2UQ = 1.57 ms  Let Sun = 5	P	Vin a		Mark and a second
$= \frac{9m \log 4 \times 1}{2\pi \log 4} = \frac{9m}{2\pi \log 4}$ $= \frac{9m}{2\pi \log 4} \times \frac{1}{2\pi \log 4} = \frac{9m}{2\pi \log 4}$ $= \frac{9m}{2\pi \log 4} \times \frac{1}{2\pi \log 4} = \frac{9m}{2\pi \log 4}$ $= \frac{9m}{2\pi \log 4} \times \frac{1}{2\pi \log 4} = \frac{9m}{2\pi \log 4}$ $= \frac{9m}{2\pi \log 4} \times \frac{1}{2\pi \log 4} = \frac{9m}{2\pi \log 4}$ $= \frac{9m}{2\pi \log 4} \times \frac{1}{2\pi \log 4} = \frac{9m}{2\pi \log 4}$ $= \frac{9m}{2\pi \log 4} \times \frac{1}{2\pi \log 4} = \frac{9m}{2\pi \log 4}$ $= \frac{9m}{2\pi \log 4} \times \frac{1}{2\pi \log 4} = \frac{9m}{2\pi \log 4}$ $= \frac{9m}{2\pi \log 4} \times \frac{1}{2\pi \log 4} = \frac{9m}{2\pi \log 4}$ $= \frac{9m}{2\pi \log 4} \times \frac{1}{2\pi \log 4} = \frac{9m}{2\pi \log 4}$ $= \frac{9m}{2\pi \log 4} \times \frac{1}{2\pi \log 4} = \frac{9m}{2\pi \log 4}$ $= \frac{9m}{2\pi \log 4} \times \frac{1}{2\pi \log 4} = \frac{9m}{2\pi \log 4}$ $= \frac{9m}{2\pi \log 4} \times \frac{1}{2\pi \log 4} = \frac{9m}{2\pi \log 4}$ $= \frac{9m}{2\pi \log 4} \times \frac{1}{2\pi \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{9m}{2\pi \log 4} \times \frac{1}{2\pi \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2\pi \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2\pi \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2\pi \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{10 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = \frac{1.57 \log 4}{10 \log 4}$ $= \frac{1.57 \log 4}{10 \log 4} \times \frac{1}{2 \log 4} = $	(A = .c)	Gian X BW		79
2TT locat Q ZUQL  " 9m = 6Bw. 2UQ = 1.57 ms  Let 9m = 5 25 - limited range  TD strong weak  "inversion inversion	-0	and a second	T	
inversion  2TT lost Q  2TT lost Q  2TT Cost Q  2TT Cos	=	9m Root x _	= Gm	A de la
let <u>Sm</u> = 5 25 -> limited range <u>TD</u> strong was inversion		2TT lout Q	ZUC	
let <u>Sm</u> = 5 25 -> limited range <u>TD</u> strong was inversion			- darke	and the same of th
let <u>Sm</u> = 5 25 -> limited range ID strong wak  inversion inversion		" 9m = 6kw. 200	= 1.57	ms
inversion inversion		4) - tan _ 2		
inversion inversion	let	9m = 5 ~	25	-> limited
		ID Strang	wal	
" 8m = 1:57 mg		inversion	inver	sion
	**	8m = 1:57 mg		
			-	
$\uparrow I_D = 314 \text{ MA} \qquad 62.8 \text{ MA}$		· ID = 314 MA /	~ 6	2.8 MA
Strong Inv. weak inversion				

