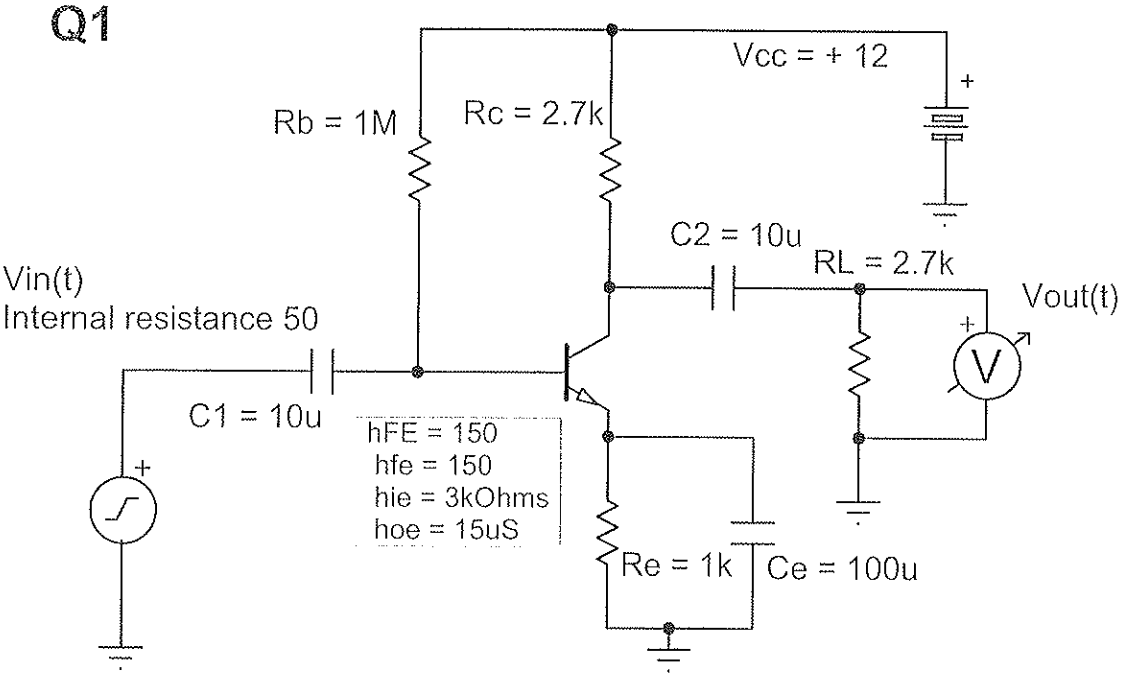
Student Name:
Student ID:
Just fill in the answers in the spaces provided; no working is required.

Q1

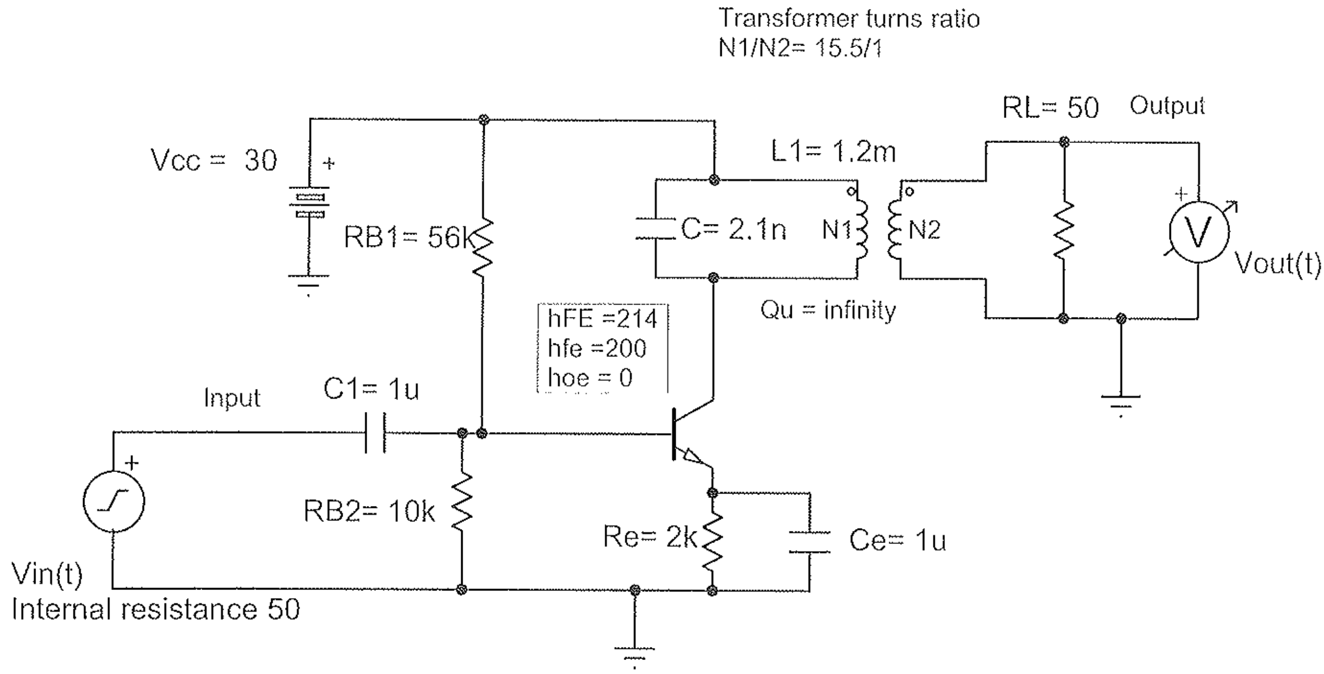


For the circuit shown find:

(a) The DC bias base current Ib =	uA
(b) The DC bias collector current Ic =	mA
(c) The DC bias emitter voltage Ve =	V
(d) The DC bias base voltage Vb =	V
(e) The DC bias collector voltage Vc =	V
(f) The BJT emmitter resitor re =	Ohms
(g) The mid-band small signal gain as a ratio =	
(h) The mid-band small signal gain in dB =	dB
(i) The mid-band input resistance Rin =	kOhms
(j) The low -3dB cutoff frequency caused by Ce =	Hz

Marks out of 20

Q2



For the circuit shown find:

(a) The Thevin equivalent voltage of Vcc with RB1 and RB2 =	V
(b) The Thevenin equivalent resistance of RB1 and RB2 =	kOhms
(c) The DC bias base current Ib =	uA
(d) The DC bias collector current Ic =	mA
(e) The BJT emitter resistor re =	Ohms
(f) The resonant frequency f0 =	kHz
(g) The total load resistance as seen by the collector RL' =	kOhms
(h) The small signal ac gain =	dB
(i) The loaded Q of the output circuit QL =	
(j) The bandwidth BW =	kHz

Marks of of 20

ENEL434 Test - Model answers
(with some explanations)

Q 1

(a) $12 - I_B \times 1000 \times 10^3 - 0.7 - 150 \times 10^3 I_B = 0$

$\therefore I_B = 11.3 / 1150 \times 10^3 = 9.83 \mu A.$

(b) $I_c = 150 \times 9.83 \times 10^{-6} = 1.474 mA.$

(c) $V_E = I_e R_E = \underbrace{(1.474 \times 10^{-3} + 9.83 \times 10^{-6})}_{I_e} \times 10^3$

$= 1.48V.$

(d) $V_B = 1.48V + 0.7V = 2.18V.$

(e) $V_c = 12 - 2.7 \times 10^3 \times \underbrace{1.474 \times 10^{-3}}_{I_c} = 8.02V.$

(f) $r_e = 0.026/I_c = 17.57 \Omega.$

(g) $R_C' = R_C // R_L // 1/h_{oe}$

$= 1.35 \times 10^{+3} // 66.67 \times 10^3$

$= 1.32 k\Omega$

$\therefore A_{vss} = -1.32 \times 10^3 / 17.57 = -75.$

(h) Gain $= 37.5 dB.$

(i) $R_{in} = 1 \times 10^6 // 3 \times 10^3 = 2.99 k\Omega.$

$\alpha r = 1 \times 10^6 // 150 \times 17.57 = 2.63 k\Omega.$

(j) $\boxed{R_{discharge} = R_E // \left(r_e + \frac{R_B // R_{gen}}{h_{fe}}\right) = 17.59 \Omega.}$

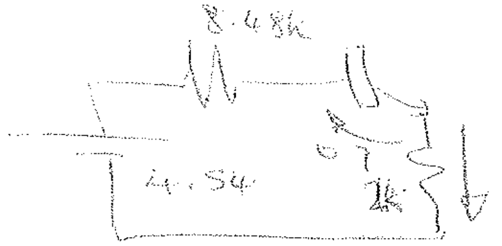
$\therefore f_L = \frac{1}{2\pi R_{dis} C} = 90 Hz.$

Q 2.

(a) $V_{TH} = 30 \times 10/66 = 4.54\text{V}$

(b) $R_{TH} = 10k // 56k = 8.48k\Omega$

(c)



$4.54 - I_B \times 8.48 \times 10^3 - 0.7 - I_B \times 214 \times 2 \times 10^3 = 0$

$\therefore I_B = 8.8\mu A$

(d) $I_C = 1.88\text{mA}$

(e) $r_e = 13.8\Omega$

(f) $f_o = \frac{1}{2\pi}\frac{1}{\sqrt{LC}} = 100\text{kHz}$

(g) $R_L' = 12k\Omega \quad (n^2 R_L)$

(h) $\frac{V_c(t)}{V_{in}(t)} = -\frac{12 \times 10^3}{13.8} = 870 \quad \boxed{\frac{v_o(t)}{v_{in}(t)} = -\frac{870}{15.5} = -56}$

$\text{gain} = 35\text{dB}$

(i) $Q_L = R_L'/X_L = 12k/754 = 15.9$

$\therefore BW = f_o/Q_L = 6.28\text{kHz}$