

Unit 5 - WEEK 3

Course outline

How does an NPTEL online course work?

Week 0 Assignment 0

WEEK 1

WEEK 2

WEEK 3

- Lecture 14 : Analysis of simple non - linear circuit containing a BJT
- Lecture 15 : Analysis of simple non - linear circuit containing a BJT (Contd.)
- Lecture 16 : Analysis of simple non - linear circuit containing a MOSFET
- Lecture 17 : Analysis of simple non - linear circuit containing a MOSFET (Contd.)
- Lecture 18 : Linearization of non - linear circuit containing BJT
- Lecture 19 : Linearization of non - linear circuit containing BJT (Contd.)
- Lecture 20 : Linearization of non - linear circuit containing MOSFET
- Lecture 21 : Linearization of non-linear circuit containing MOSFET (Contd.)

Week 3 Lecture material

Quiz : Week 3 Assignment 3

Week 3 Feedback Form

WEEK 4

WEEK 5

WEEK 6

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WEEK 8

WEEK 9

WEEK 10

WEEK 11

WEEK 12

Supplementary material

Download Videos

Detail solution

Live Interactive Session

Text Transcripts

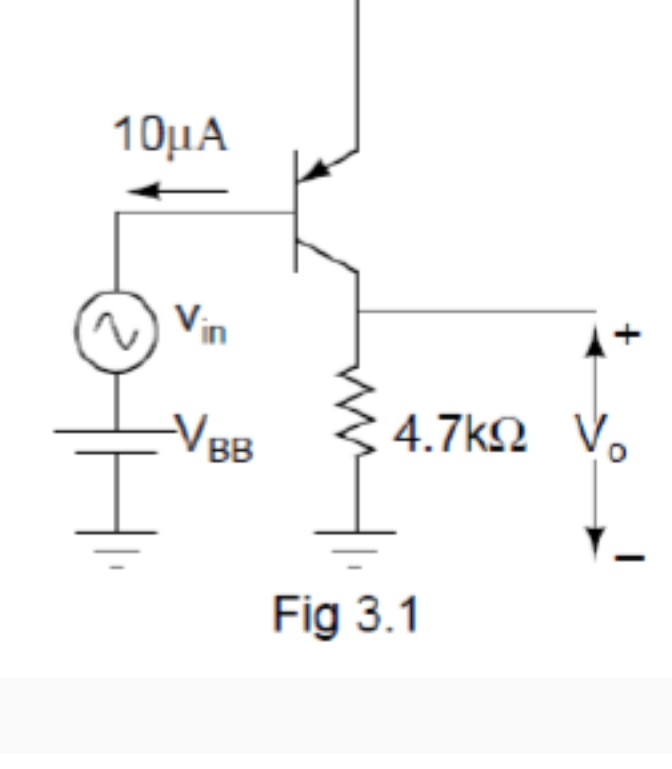
Week 3 Assignment 3

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2020-02-19, 23:59 IST.

Common data for Q 3.1 to Q 3.3:

For the circuit shown in Fig 3.1, consider $V_{BE(on)} \approx 0.6V$, $\beta = 100$, thermal equivalent voltage $V_T = 26 mV$ and early voltage is very high. V_{BB} is such that the d.c. current through the base terminal is $10 \mu A$.



1) By calculating transconductance of BJT, find the amplitude of signal current flowing through collector terminal for an input signal having 10 mV amplitude. Select the closest option from the following: 2 points

a) 3.8 mA b) 1.9 mA c) 384.6 μA d) 1 mA e) 192.3 μA

- a)
- b)
- c)
- d)
- e)

No, the answer is incorrect. Score: 0

Accepted Answers: c)

2) Find the value of I_B . Select the closest option from the following: 1 point

a) 2.6 k Ω b) 260 k Ω c) 26 Ω d) 26 k Ω e) 260 Ω

- a)
- b)
- c)
- d)
- e)

No, the answer is incorrect. Score: 0

Accepted Answers: a)

3) Find the value of output signal voltage for $v_{in} = 2.6 mV$. Select the correct option from the following: 2 points

a) 260 mV b) 0.47 V c) 0.94 V d) 4.7 V e) 235 mV

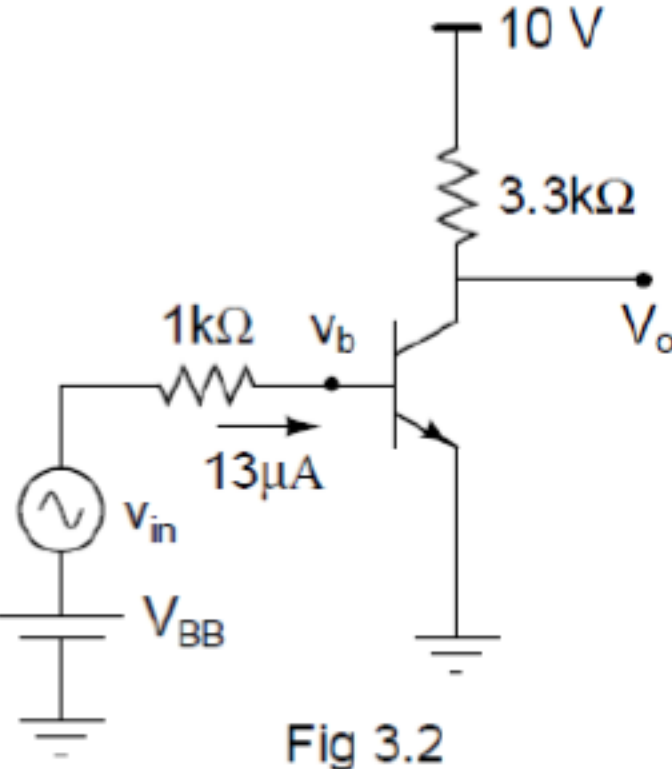
- a)
- b)
- c)
- d)
- e)

No, the answer is incorrect. Score: 0

Accepted Answers: b)

Common data for Q 3.4 to Q 3.5

For the circuit shown in Fig 3.2, consider $V_{BE(on)} \approx 0.6 V$, $\beta = 100$, thermal equivalent voltage $V_T = 26mV$ and early voltage $V_A = 100 V$. V_{BB} is such that the d.c. current through the base terminal is $13 \mu A$.



4) Find the value of base to collector voltage gain, $\left| \frac{v_{out}}{v_b} \right|$ for the circuit shown in Fig 3.2. Select the closest option from the following: 2 points

a) 65 b) 97 c) 123 d) 158 e) 105

- a)
- b)
- c)
- d)
- e)

No, the answer is incorrect. Score: 0

Accepted Answers: d)

5) Find the value of output voltage signal for $v_{in} = 10 mV$. Select the closest option from the following: 2 points

a) 1.582 V b) 0.703 V c) 4.29 V d) 1.054 V e) 5.71 V

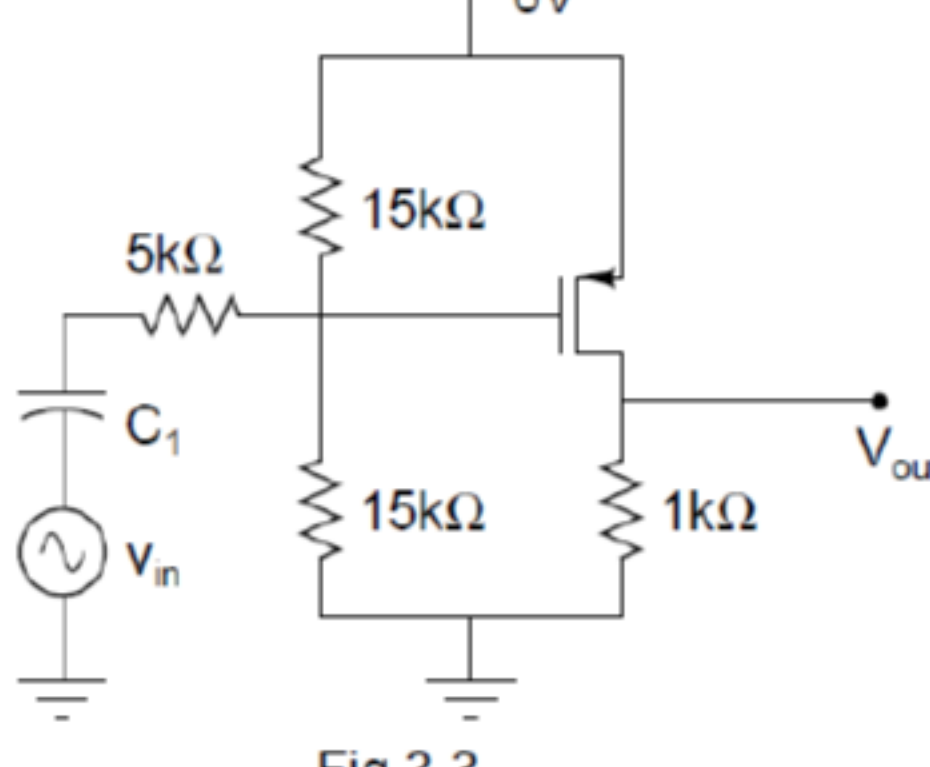
- a)
- b)
- c)
- d)
- e)

No, the answer is incorrect. Score: 0

Accepted Answers: d)

Common data for Q 3.6 to Q 3.7

For the circuit shown in Fig 3.3, the values of device parameters of the MOSFET are given by, $K \frac{W}{L} = 1 mA/V^2$, $V_{thp} = -1 V$, $\lambda \approx 0 V^{-1}$.



6) Calculate the small signal voltage gain, $|A_v| = \left| \frac{v_{out}}{v_{in}} \right|$ for the circuit shown in Fig 3.3. Assume, coupling capacitor (C_1) is shorted for the input signal. Select the correct option from the following: 2 points

a) 2 b) 1.2 c) 1.8 d) 1.4 e) 2.2

- a)
- b)
- c)
- d)
- e)

No, the answer is incorrect. Score: 0

Accepted Answers: b)

7) Find the input resistance seen from the input signal for the circuit shown in Fig 3.3. Assume, coupling capacitor (C_1) is shorted for the input signal. Select the correct option from the following: 2 points

a) 7.5 k Ω b) 5 k Ω c) 12.5 k Ω d) 20 k Ω e) 3 k Ω

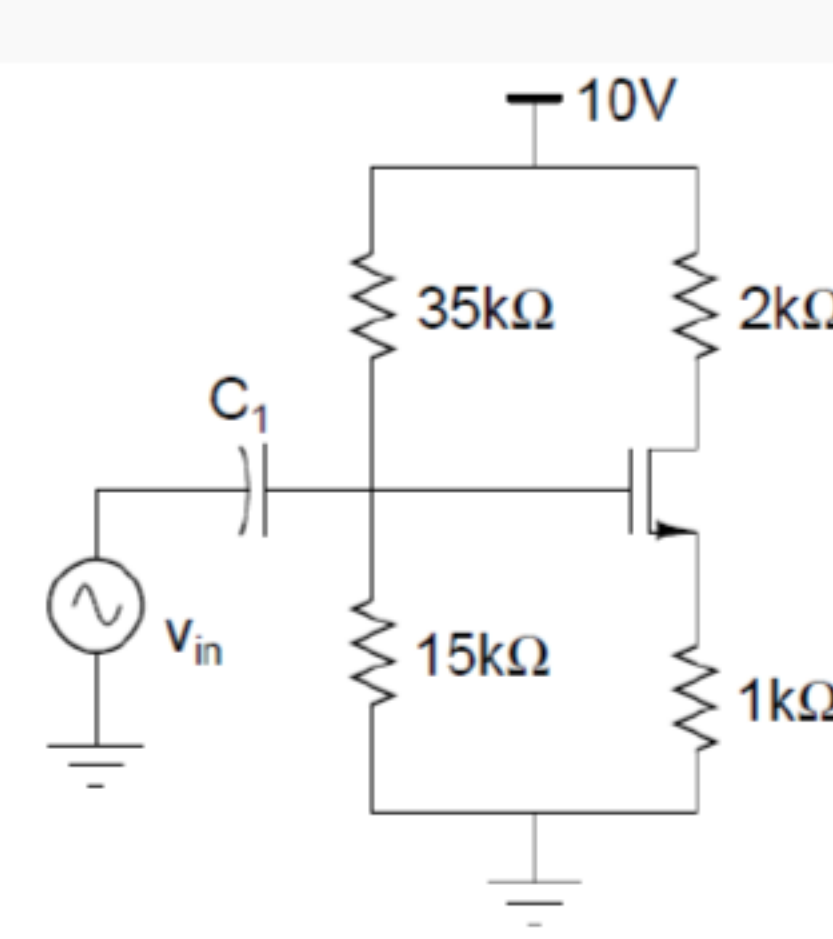
- a)
- b)
- c)
- d)
- e)

No, the answer is incorrect. Score: 0

Accepted Answers: c)

8) For the circuit shown in Fig 3.4, consider the values of device parameters $K \frac{W}{L} = 2 mA/V^2$, $\lambda \approx 0 V^{-1}$, $V_{thn} = 1 V$. Calculate the operating point (V_{DSQ} , I_{DQ}) of the transistor. Select the correct option from the following: 2 points

a) (6.4 V, 1.2 mA) b) (5.2 V, 1.6 mA)
 c) (3.6 V, 2.2 mA) d) (8 V, 1 mA)
 e) (7 V, 1 mA) f) (4 V, 2 mA)



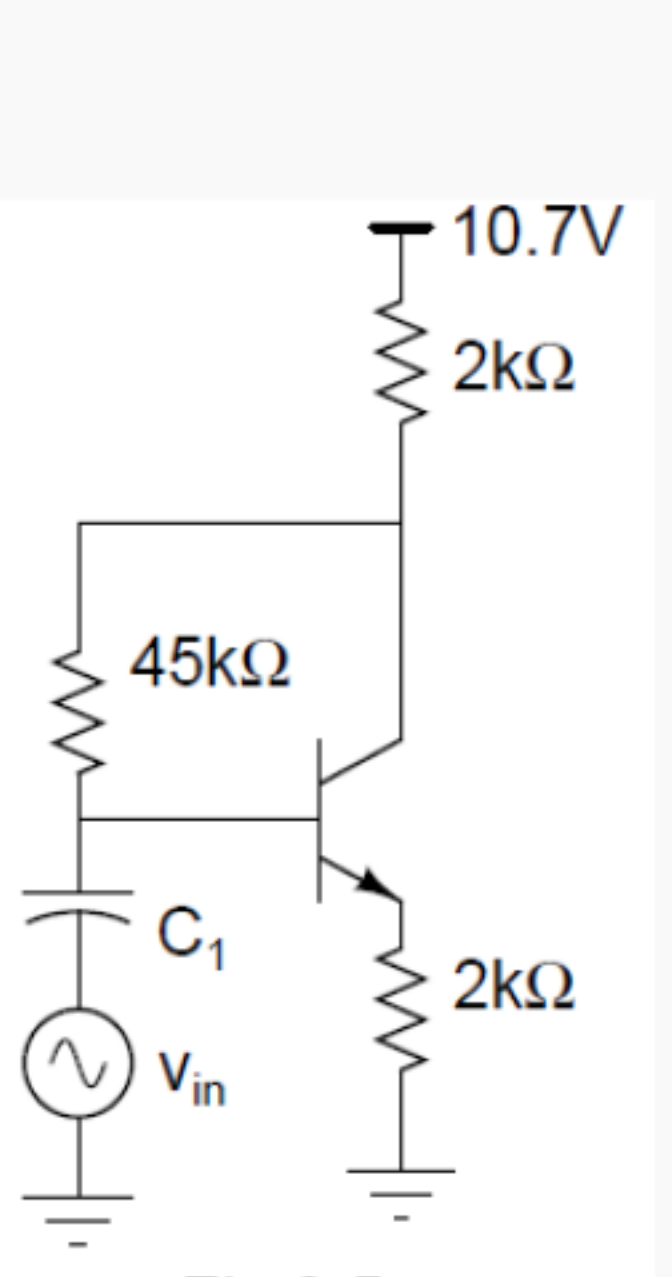
- a)
- b)
- c)
- d)
- e)
- f)

No, the answer is incorrect. Score: 0

Accepted Answers: a)

Common data for Q 3.9 to Q 3.11

For the circuit shown in Fig 3.5, consider the values of device parameters of the transistor are: $\beta = 49$, $V_{BE(on)} \approx 0.7V$, early voltage $V_A = 100 V$, thermal equivalent voltage $V_T = 26 mV$.



9) Find the operating point (V_{CEQ} , I_{CQ}) of the transistor for the circuit shown in Fig 3.5. Select the closest option from the following: 2 points

a) (4.7 V, 1.5 mA)
 b) (2.53 V, 2 mA)
 c) (0.3 V, 2.6 mA)
 d) (5.3 V, 2 mA)
 e) (6.7 V, 1 mA)

- a)
- b)
- c)
- d)
- e)

No, the answer is incorrect. Score: 0

Accepted Answers: b)

10) Find the value of r_{π} of the transistor for the circuit shown in Fig Q 3.5. Select the correct option from the following: 1 point

a) 637 Ω b) 50 k Ω c) 2.54 k Ω d) 1.26 k Ω e) 26 k Ω

- a)
- b)
- c)
- d)
- e)

No, the answer is incorrect. Score: 0

Accepted Answers: a)

11) Find the intrinsic gain (g_{m0}) of the transistor for the circuit shown in Fig Q 3.5. Select the closest option from the following: 2 points

a) 7692 b) 1923 c) 38
 d) 76 e) 3846 f) 192

- a)
- b)
- c)
- d)
- e)
- f)

No, the answer is incorrect. Score: 0

Accepted Answers: e)