

# Unit 9 - WEEK 7

**Course outline**

How does an NPTEL online course work?

**Week 0 Assignment 0**

**WEEK 1**

**WEEK 2**

**WEEK 3**

**WEEK 4**

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**WEEK 7**

- Lecture 55 : Multi-Transistor Amplifiers: Operation and Analysis (Part A)
- Lecture 56 : Multi-Transistor Amplifiers: Operation and Analysis (Part B)
- Lecture 57 : Multi-Transistor Amplifiers : Operation and Analysis (Part C)
- Lecture 58 : Multi-Transistor Amplifiers (Contd.): Numerical Examples (Part A)
- Lecture 59 : Multi-Transistor Amplifiers (Contd.): Numerical Examples (Part B)
- Lecture 60 : Multi-Transistor Amplifiers (Contd.): Numerical Examples (Part C)
- Lecture 61 : Multi-Transistor Amplifiers: Cascode Amplifier (Part A)
- Lecture 62 : Multi-Transistor Amplifiers : Cascode Amplifier (Part B)
- Week 7 Lecture material
- Quiz : Week 7 Assignment 7
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Supplementary material

Download Videos

Detail solution

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## Week 7 Assignment 7

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

Due on 2020-03-18, 23:59 IST.

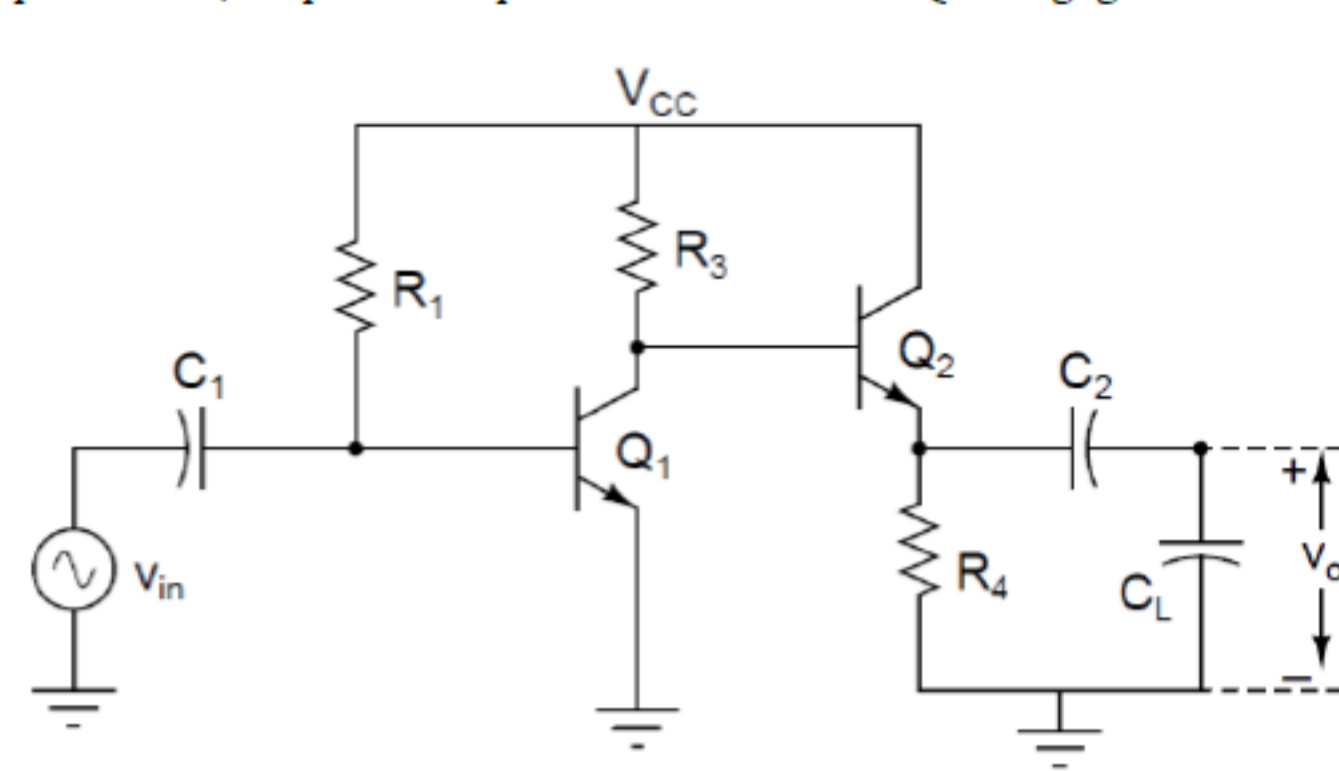
### Common data for Q 7.1 to Q 7.4:

The circuit shown in Fig 7.1 is a CE – CC amplifier.

The values of device parameters of the transistors are:  $V_{BE(ON)1} = V_{BE(ON)2} = 0.6\text{ V}$ ,  $V_{CE(SAT)1} = V_{CE(SAT)2} = 0.3\text{ V}$ ,  $\beta_1 = \beta_2 = 200$ , and the power supply  $V_{CC} = 12\text{ V}$ . Assume, early voltages of both transistors are very high.

The values of the components of the amplifier are given as:  $R_1 = 1.14\text{ M}\Omega$ ,  $R_3 = 2.7\text{ k}\Omega$ ,  $R_4 = 1.2\text{ k}\Omega$ ,  $C_1 = C_2 = 10\text{ }\mu\text{F}$ ,  $C_L = 100\text{ pF}$ .

The values of parasitic capacitances for transistor  $Q_2$  are given as:  $C_{\pi} = 10\text{ pF}$  and  $C_{\mu} = 5\text{ pF}$ . Assume, the parasitic capacitances for transistor  $Q_1$  is negligible.



1) Find the DC voltage between the collector and emitter ( $V_{CE2}$ ) terminal of the transistor  $Q_2$  as shown in Fig 7.1. Select the closest option from the following:

a) 6.6 V    b) 5.4 V    c) 6 V    d) 11.7 V    e) 7.2 V

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

No, the answer is incorrect. Score: 0

Accepted Answers: c)

2 points

2) Find the overall voltage gain,  $\left| \frac{v_o}{v_{in}} \right|$  in mid frequency range of the amplifier circuit as shown in Fig 7.1. Select the closest option from the following:

a) 204    b) 1    c) 3.5    d) 232    e) 6

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

No, the answer is incorrect. Score: 0

Accepted Answers: a)

2 points

3) Find the small signal output resistance of the amplifier circuit as shown in Fig 7.1. Select the closest option from the following:

a) 1.2 k $\Omega$     b) 242 k $\Omega$     c) 5.2  $\Omega$     d) 1.2  $\Omega$     e) 18.3  $\Omega$

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

No, the answer is incorrect. Score: 0

Accepted Answers: e)

2 points

4) Find the upper cut off frequency of the amplifier circuit as shown in Fig 7.1. Select the closest option from the following:

a) 86.9 MHz    b) 11.9 MHz    c) 49.4 MHz    d) 306 MHz    e) 1.3 MHz

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

No, the answer is incorrect. Score: 0

Accepted Answers: b)

2 points

### Common data for Q 7.5 to Q 7.9:

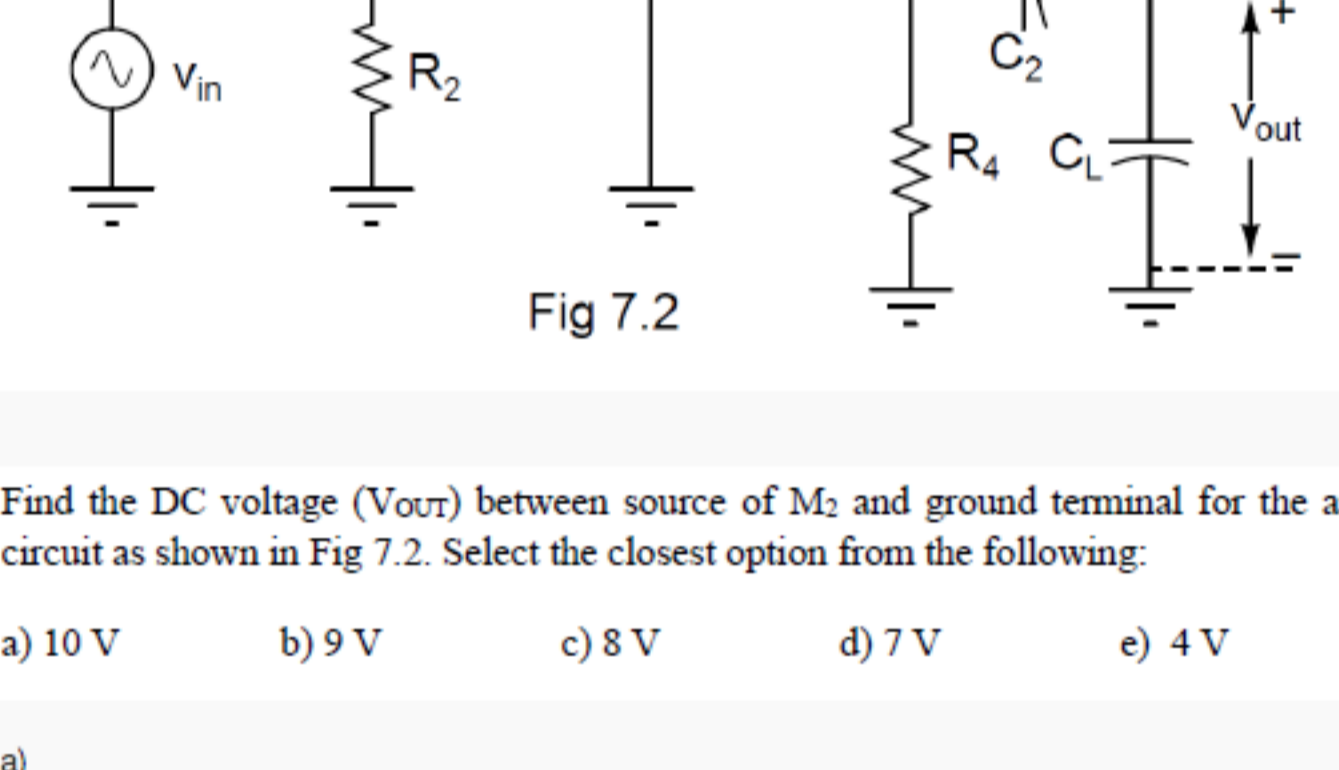
The circuit shown in Fig 7.2 is a CS – CD amplifier.

The values of device parameters for both transistors are given as:  $K \frac{W}{L} = 0.5\text{ mA/V}^2$ ,  $V_{th} = 1\text{ V}$ ,  $\lambda = 0.01\text{ V}^{-1}$ .

The values of the components in the amplifier are given as:  $R_1 = 70\text{ k}\Omega$ ,  $R_2 = 30\text{ k}\Omega$ ,  $R_3 = 3\text{ k}\Omega$ ,  $R_4 = 4\text{ k}\Omega$ ,  $C_1 = C_2 = 10\text{ }\mu\text{F}$ ,  $C_L = 100\text{ pF}$ .

The values of parasitic capacitance of transistor  $M_2$  are given as:  $C_{gs} = 10\text{ pF}$  and  $C_{gd} = 5\text{ pF}$ . Assume, the parasitic capacitances for transistor  $M_1$  is negligible.

The supply voltage for the amplifier is given as,  $V_{dd} = 10\text{ V}$ .



5) Find the DC voltage ( $V_{O(D)}$ ) between source of  $M_2$  and ground terminal for the amplifier circuit as shown in Fig 7.2. Select the closest option from the following:

a) 10 V    b) 9 V    c) 8 V    d) 7 V    e) 4 V

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

No, the answer is incorrect. Score: 0

Accepted Answers: e)

2 points

6) Find the small signal output resistance of the amplifier circuit as shown in Fig 7.2. Select the closest option from the following:

a) 104 k $\Omega$     b) 100 k $\Omega$     c) 4 k $\Omega$     d) 800  $\Omega$     e) 1 k $\Omega$

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

No, the answer is incorrect. Score: 0

Accepted Answers: d)

2 points

7) Find the voltage gain,  $\left| \frac{v_{out}}{v_{in}} \right|$  in mid frequency range of the amplifier circuit as shown in Fig 7.2. Select the closest option from the following:

a) 3.8    b) 2.4    c) 1    d) 9    e) 6

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

No, the answer is incorrect. Score: 0

Accepted Answers: b)

2 points

8) Find the upper cut off frequency of the amplifier circuit as shown in Fig 7.2. Select the closest option from the following:

a) 2 MHz    b) 10.6 MHz    c) 40.1 MHz    d) 530 kHz    e) 12.5 MHz

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

No, the answer is incorrect. Score: 0

Accepted Answers: a)

1 point

9) Refer to the circuit in Fig 7.2, find the amplitude of output signal for an input sinusoidal signal of amplitude 100 mV<sub>p-p</sub>. Select the closest option from the following:

a) 380 mV<sub>p-p</sub>    b) 100 mV<sub>p-p</sub>    c) 240 mV<sub>p-p</sub>    d) 0.6 V<sub>p-p</sub>    e) 0.9 V<sub>p-p</sub>

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

No, the answer is incorrect. Score: 0

Accepted Answers: c)

1 point

10) The advantage of CE – CC amplifier over CE amplifier. Select the correct options from the given options:

(a) Voltage gain is improved.  
(b) Band width is improved.  
(c) Output resistance is increased.  
(d) Output resistance is decreased.  
(e) Both voltage gain and bandwidth are improved.

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

No, the answer is incorrect. Score: 0

Accepted Answers: (b)

1 point

11) The advantage of cascode (BJT based) amplifier over CE amplifier. Select the correct option from the given options:

(a) Only, voltage gain is improved  
(b) Input capacitance is decreased  
(c) Only, bandwidth is improved  
(d) None of the above

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect. Score: 0

Accepted Answers: (b)

1 point

12) The current gain of cascode (BJT based) amplifier over CE amplifier. Select the correct option from the given options:

(a) Increases more  
(b) Decreases more  
(c) Approximately same  
(d) None of the above

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect. Score: 0

Accepted Answers: (c)

1 point