

# Unit 6 - WEEK 4

**Course outline**

How does an NPTEL online course work?

**Week 0 Assignment 0**

**WEEK 1**

**WEEK 2**

**WEEK 3**

**WEEK 4**

- Lecture 22 : Linear models of Amplifiers (Part A)
- Lecture 23 : Linear models of Amplifiers (Part B)
- Lecture 24 : Common Emitter Amplifier (Part A)
- Lecture 25 : Common Emitter Amplifier (Part B)
- Lecture 26 : Common Emitter Amplifier (contd.) (Part A)
- Lecture 27 : Common Emitter Amplifier (contd.) (Part B)
- Lecture 28 : Common Emitter Amplifier (contd.) - Numerical examples (Part A)
- Lecture 29 : Common Emitter Amplifier (contd.) - Numerical examples (Part B)
- Lecture 30 : Common Emitter Amplifier (contd.) - Design guidelines (Part A)
- Lecture 31 : Common Emitter Amplifier (contd.) - Design guidelines (Part B)
- Lecture 32 : Common Source Amplifier (Part A)
- Lecture 33 : Common Source Amplifier (Part B)
- Lecture 34 : Common Source Amplifier (contd.) Numerical examples and design guidelines (Part B)
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- Quiz : Week 4 Assignment 4
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**WEEK 9**

**WEEK 10**

**WEEK 11**

**WEEK 12**

Supplementary material

Download Videos

Detail solution

Live Interactive Session

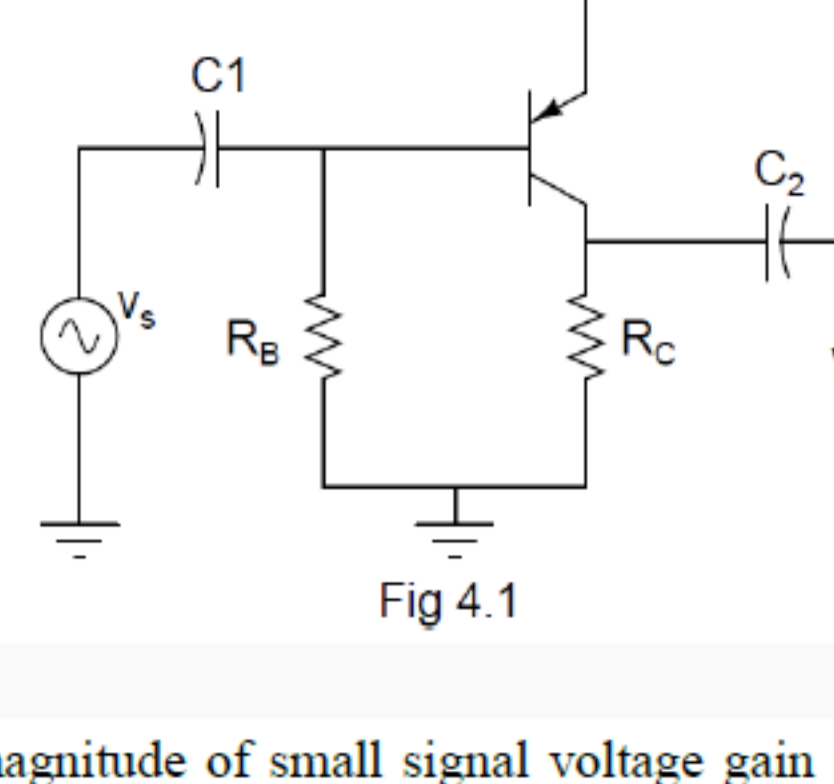
Text Transcripts

## Week 4 Assignment 4

The due date for submitting this assignment has passed. **Due on 2020-03-01, 23:59 IST.**  
As per our records you have not submitted this assignment.

### Common data for Q 4.1 to Q 4.5:

For the circuit shown in Fig 4.1, consider the values of CE amplifier  $R_B = 470k\Omega$ ,  $R_C = 3k\Omega$ ,  $\beta = 100$ ,  $V_{EB(on)} \approx 0.6V$ ,  $V_{EC(sat)} \approx 0.2V$ , thermal equivalent voltage  $V_T = 26 mV$  and early voltage is very high.



1) For the circuit shown in Fig 4.1 find the magnitude of small signal voltage gain (in dB). Assume the signal coupling capacitors are shorted while doing the small signal analysis. Select the closest option from the following:

- a) 230.7      b) 47.2      c) 10      d) 23.6      e) 23
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: b)

2) Find the small signal input resistance for the circuit shown in Fig 4.1. Select the closest option from the following:

- a) 470 kΩ      b) 3 kΩ      c) 13 Ω      d) 1.3 kΩ      e) 2.6 kΩ
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: d)

3) Find the value of signal coupling capacitor C1 such that the lower cut off frequency of the amplifier shown in Fig 4.1 is 100 rad/sec. Select the closest option from the following:

- a) 1.22 μF      b) 8.1 μF      c) 10 μF      d) 21.27 nF      e) 7.69 μF
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: e)

4) Find the maximum output signal swing without "significant distortion" for a sinusoidal input as shown in the Fig 4.1. Select the correct option from the following:

- a) 12 V<sub>P-P</sub>      b) 9.8 V<sub>P-P</sub>      c) 6 V<sub>P-P</sub>      d) 7.6 V<sub>P-P</sub>      e) 10 V<sub>P-P</sub>
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: d)

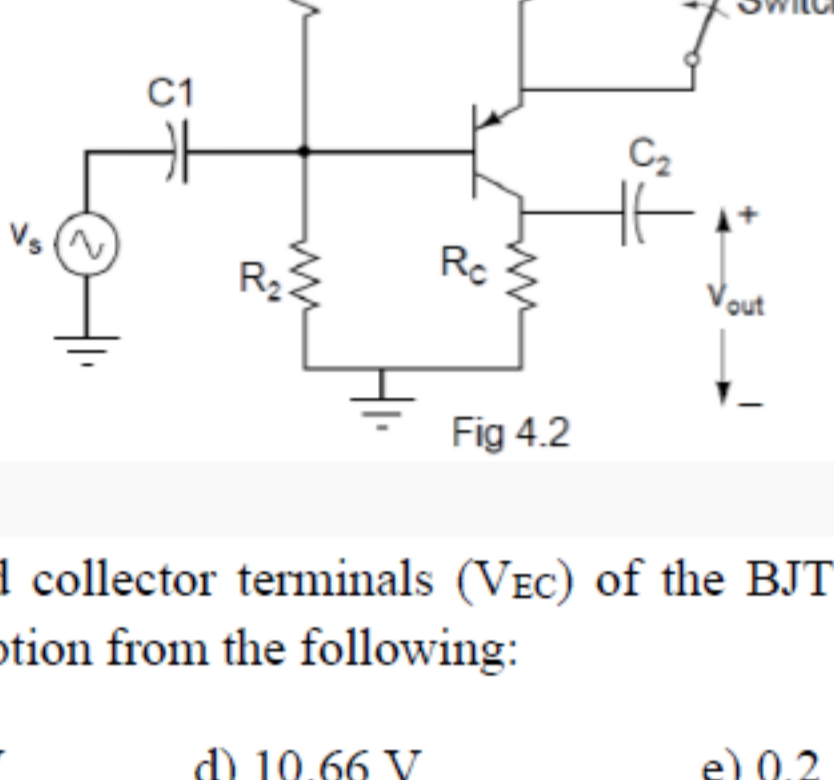
5) Find the maximum input signal swing for the circuit shown in the Fig 4.1. Select the closest option from the following:

- a) 52 mV<sub>P-P</sub>      b) 26 mV<sub>P-P</sub>      c) 32.94 mV<sub>P-P</sub>      d) 16.47 mV<sub>P-P</sub>      e) 161 mV<sub>P-P</sub>
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: c)

### Common data for Q 4.6 to Q 4.9

For the circuit shown in Fig 4.2, consider  $R_1 = 40 k\Omega$ ,  $R_2 = 80 k\Omega$ ,  $R_C = 3.3 k\Omega$ ,  $R_E = 3.4 k\Omega$ ,  $V_{CC} = 12V$ ,  $V_{EB(on)} \approx 0.6V$ ,  $V_{EC(sat)} \approx 0.2V$ ,  $\beta = 100$ , thermal equivalent voltage  $V_T = 26mV$  and early voltage is very high.



6) Find the DC voltage across the emitter and collector terminals ( $V_{EC}$ ) of the BJT for the circuit shown in Fig 4.2. Select the closest option from the following:

- a) 5.33 V      b) 8.6 V      c) 3.26 V      d) 10.66 V      e) 0.2 V
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: a)

7) By considering the  $\beta = 200$  find the DC voltage across the emitter and collector terminals ( $V_{EC}$ ) of the BJT for the circuit shown in Fig 4.2. Select the closest option from the following:

- a) 5.31 V      b) 8.6 V      c) 3.28 V      d) 10.62 V      e) 0.2 V
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: a)

8) Find the ratio of small signal voltage gains of the amplifier with and without bypass capacitor ( $C_E$ ) for the circuit shown in Fig 4.2. Select the closest option from the following:

- a) 48.13      b) 125.66      c) 255.1      d) 41.98      e) 131.76
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: e)

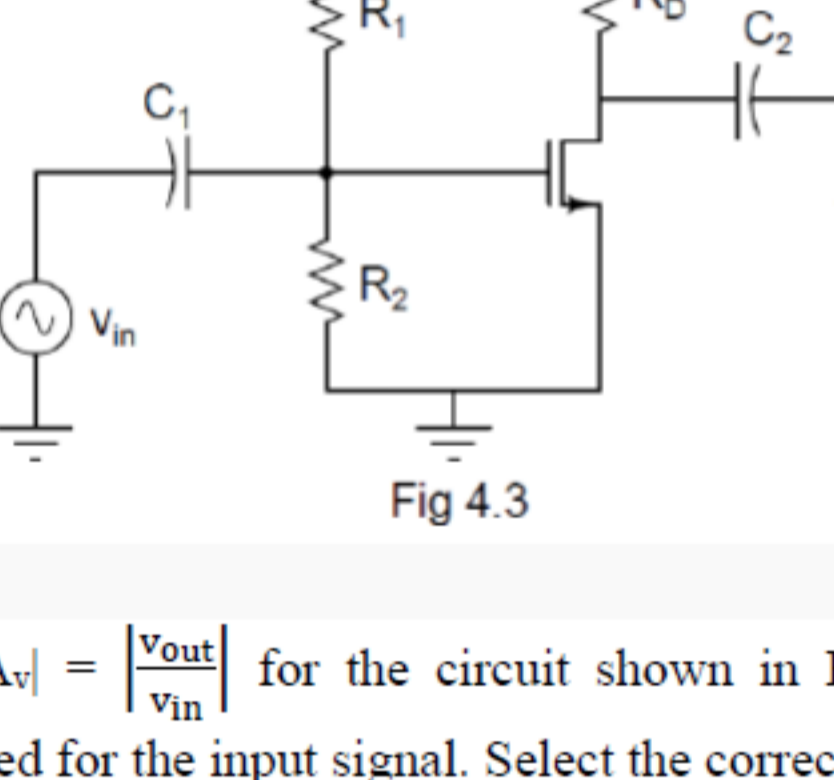
9) Find the input resistance (in kΩ) for the circuit shown in Fig 4.2 by assuming the bypass capacitor is not present (i.e., the switch is opened). Select the closest option from the following:

- a) 26.66      b) 2.62      c) 24.75      d) 122.62      e) 13.33
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: c)

### Common data for Q 4.10 to Q 4.15

For the circuit shown in Fig 4.3, the values of device parameters of the MOSFET are given by,  $K \frac{W}{L} = 1 mA/V^2$ ,  $V_{thn} = 1 V$ ,  $\lambda \approx 0 V^{-1}$ . The values of components are given by  $R_1 = 35 k\Omega$ ,  $R_2 = 15 k\Omega$ ,  $R_D = 3 k\Omega$ , and  $V_{dd} = 10 V$ .



10) Calculate the small signal voltage gain,  $|A_v| = \left| \frac{V_{out}}{V_{in}} \right|$  for the circuit shown in Fig 4.3. Assume, signal coupling capacitors are shorted for the input signal. Select the correct option from the following:

- a) 1.33      b) 2      c) 3      d) 6      e) 0.85
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: d)

11) Find the input resistance for the circuit shown in Fig 4.3. Assume, signal coupling capacitors are shorted while doing the small signal analysis. Select the correct option from the following:

- a) 35 kΩ      b) 10.5 kΩ      c) 15 kΩ      d) 50 kΩ      e) 3 kΩ
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: b)

12) Find the output resistance for the circuit shown in Fig 4.3. Assume, signal coupling capacitors are shorted while doing the small signal analysis. Select the correct option from the following:

- a) 2.33 kΩ      b) 10.5 kΩ      c) 15 kΩ      d) 13.5 kΩ      e) 3 kΩ
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: e)

13) Find the value of signal coupling capacitor C1 such that the lower cut off frequency of the amplifier shown in Fig 4.3 is 15 Hz. Select the closest option from the following:

- a) 6.3 μF      b) 1 μF      c) 1.33 μF      d) 212.7 nF      e) 22.2 μF
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: b)

14) Find the power dissipation of the amplifier (including biasing circuit) as shown in Fig 4.3. Select the correct option from the following:

- a) 22 mW      b) 2 mW      c) 20 mW      d) 12 mW      e) 6 mW
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: a)

15) For the circuit shown in Fig 4.3, find the maximum output signal swing without "significant distortion" for a sinusoidal input. Select the closest option from the following:

- a) 10 V<sub>P-P</sub>      b) 4 V<sub>P-P</sub>      c) 2 V<sub>P-P</sub>      d) 8 V<sub>P-P</sub>      e) Not known
- a)  b)  c)  d)  e)

No, the answer is incorrect. Score: 0 Accepted Answers: b)