Started on	Thursday, 18 August 2022, 1:57 PM
State	Finished
Completed on	Thursday, 18 August 2022, 4:11 PM
Time taken	2 hours 14 mins
Grade	**103.00** out of 106.00 (**97**%)

Question **1**

Correct

Mark 2.00 out of 2.00

Which of the following is true for a PNP BJT operating in the forward-active region ?

Select one:

- a. The collector current consists primarily of holes injected from the collector into the base
- b. None of these ✔
- c. The base current consists primarily of holes injected from the emitter into the base
- d. The emitter current consists primarily of electrons injected from the base into the emitter
- e. Some base current flows to replace holes which are lost as electrons diffusing across the base recombine

Correct

Marks for this submission: 2.00/2.00.

Question **2**

Correct

Mark 2.00 out of 2.00

Which of the following is true for an NPN BJT ?

Select one:

- a. A P-type base is sandwiched between an N-type emitter and an N-type collector
- b. The base current consists of mostly holes
- c. Current flows primarily because of electrons injected into the base
- d. Current flows when either Vbe or Vbc are positive voltages
- e. All of these ✔

Correct

Marks for this submission: 2.00/2.00.

Question **3**

Correct

Mark 2.00 out of 2.00

For a PNP BJT operating in the cutoff region, which of the following is true?

Select one:

- a. Current flows into the emitter and into the collector
- b. Current flows into the emitter and out of the collector
- c. None of these ✔
- d. Current flows out of the emitter and into the collector
- e. Current flows out of the emitter and out of the collector

Correct

Marks for this submission: 2.00/2.00.

Question **4**

Correct

Mark 2.00 out of 2.00

An PNP BJT operating in the forward-active region has :

Select one:

- a. Vbe > 0 and Vbc < 0
- b. Vbe > 0 and Vbc > 0
- c. None of these
- d. Vbe < 0 and Vbc < 0
- e. Vbe < 0 and Vbc > 0 ✔

Correct

Marks for this submission: 2.00/2.00.

Question **5**

Correct

Mark 2.00 out of 2.00

If an NPN BJT at 75°C with a constant collector current of 100µA has a Vbe voltage of 770mV, then what will Vbe be for this same BJT at 50°C ?

Select one:

- a. 820mV ✔
- b. 620mV
- c. 670mV
- d. 720mV
- e. None of these

Correct

Marks for this submission: 2.00/2.00.

Question **6**

Correct

Mark 2.00 out of 2.00

As |Vce| increases for a BJT in the forward active region, “base-width modulation” causes :

Select one:

- a. The width of the base to increase
- b. None of these ✔
- c. The output resistance, ro , to increase
- d. The collector current for the BJT to decrease
- e. The width of the base-collector depletion region to decrease

Correct

Marks for this submission: 2.00/2.00.

Question **7**

Correct

Mark 2.00 out of 2.00

For a BJT emitter-follower amplifier, which of the following is true ?

Select one:

- a. The input signal is applied to the emitter
- b. All of these
- c. The output signal is measured at the base
- d. The collector is used by both the input and output ports ✔
- e. NPNs and PNPs use different circuit topologies

Correct

Marks for this submission: 2.00/2.00.

Question **8**

Correct

Mark 2.00 out of 2.00

For a BJT common-base amplifier, which of the following is true ?

Select one:

- a. The base is used by both the input and output ports
- b. The output signal is measured at the collector
- c. The input signal is applied to the emitter
- d. All of these ✔
- e. NPNs and PNPs use the same circuit topologies

Correct

Marks for this submission: 2.00/2.00.

Question **9**

Correct

Mark 2.00 out of 2.00

Which of the following MOS amplifier types is most similar to a BJT common-emitter amplifier ?

Select one:

- a. All of these
- b. Common-drain
- c. None of these
- d. Common-source ✔
- e. Common-gate

Correct

Marks for this submission: 2.00/2.00.

Question **10**

Correct

Mark 2.00 out of 2.00

For a MOS common-gate amplifier, which of the following is true ?

Select one:

- a. The drain is used by both the input and output ports
- b. The input signal is applied to the gate
- c. NMOS and PMOS FETs use different circuit topologies
- d. None of these ✔
- e. The output signal is measured at the source

Correct

Marks for this submission: 2.00/2.00.

Question **11**

Correct

Mark 2.00 out of 2.00

NPN BJTs have a p-type base sandwiched between an n-type emitter and an n-type collector.

Select one:

- True ✔
- False

Correct

Marks for this submission: 2.00/2.00.

Question **12**

Correct

Mark 2.00 out of 2.00

A BJT with 10x the emitter area of a smaller BJT will have 1/10 the collector current of the smaller BJT at the same bias voltage.

Select one:

- True
- False ✔

Correct

Marks for this submission: 2.00/2.00.

Question **13**

Correct

Mark 2.00 out of 2.00

On the circuit symbol used for a BJT, the arrow on the emitter always points from the N-side of the junction to the P-side.

Select one:

- True
- False ✔

Correct

Marks for this submission: 2.00/2.00.

Question **14**

Correct

Mark 2.00 out of 2.00

On the circuit symbol used for a BJT, the arrow on the emitter always points from the P-side of the junction to the N-side.

Select one:

- True ✔
- False

Correct

Marks for this submission: 2.00/2.00.

Question **15**

Correct

Mark 2.00 out of 2.00

The input resistance in a voltage amplifier model is used to determine the signal lost due to the current division between the source resistance and the input resistance of the amplifier.

Select one:

- True
- False ✔

Correct

Marks for this submission: 2.00/2.00.

Question **16**

Correct

Mark 2.00 out of 2.00

Ideally, the output resistance for a current amplifier would be zero.

Select one:

- True
- False ✔

Correct

Marks for this submission: 2.00/2.00.

Question **17**

Correct

Mark 2.00 out of 2.00

The output resistance for a common-base amplifier is the same as the output resistance for a common-emitter amplifier.

Select one:

- True ✔
- False

Correct

Marks for this submission: 2.00/2.00.

Question **18**

Correct

Mark 2.00 out of 2.00

The resistance looking into the collector of a BJT is typically high.

Select one:

- (●) True ✔
- ( ) False

Correct

Marks for this submission: 2.00/2.00.

Question **19**

Correct

Mark 2.00 out of 2.00

BJT common-collector and MOSFET common-emitter amplifiers are very similar.

Select one:

- ( ) True
- (●) False ✔

Correct

Marks for this submission: 2.00/2.00.

Question **20**

Correct

Mark 2.00 out of 2.00

All three MOS amplifier types (CS, CG, CD) are identical when the input and output are applied.

Select one:

- ( ) True
- (●) False ✔

Correct

Marks for this submission: 2.00/2.00.

Question **21**

Correct

Mark 6.00 out of 6.00

What is the base-to-emitter resistance, rπ, in kΩ for an PNP BJT operating in the forward-active region at 27° C with Ic = 895μA? Use: β = 14 and Vt = kT/q = 26mV.

Answer: 0.407 ✔

Correct

Marks for this submission: 6.00/6.00.

Question **22**

Correct

Mark 6.00 out of 6.00

What is the device transconductance, gm, in mA/V for an NMOS FET operating in saturation with Id = 149μA ? Use: W/L = 61 and k'n = 100μA/V^2. Neglect the effects of channel-length modulation and body effect.

Answer: 1.35 ✔

Correct

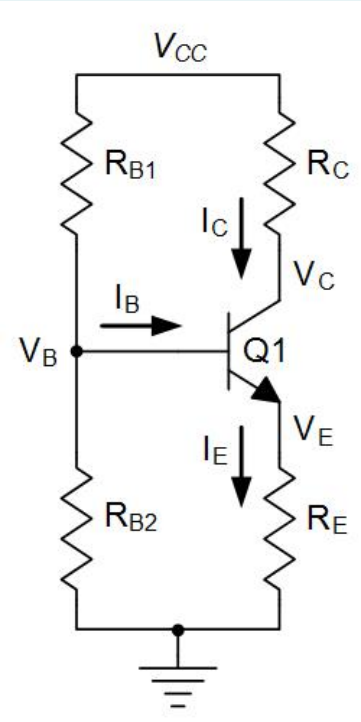
Marks for this submission: 6.00/6.00.

Question **23**

Correct

Mark 6.00 out of 6.00

For the BJT bias circuit shown, what value of Re in kilohms is needed to set the collector bias current to 0.90mA ? Use Vcc = 11V, Rb1 = 30.5kΩ, and Rb2 = 29.4kΩ. Assume that the transistor is in the forward-active region, with β = 45 and |Vbe(on)| = 0.7V. Neglect the effects of base-width modulation.



Answer: 4.78 ✔

Correct

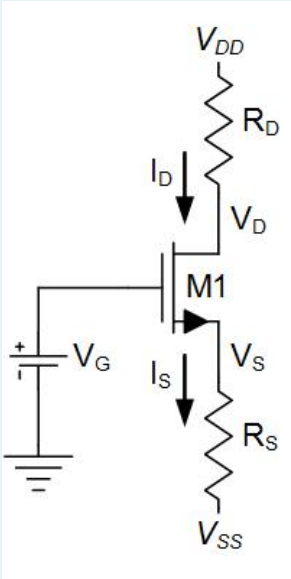
Marks for this submission: 6.00/6.00.

Question **24**

Correct

Mark 6.00 out of 6.00

For the MOSFET bias circuit shown, what value of Rs in kilohms is needed to set the drain bias current to 0.31mA ? Assume that the transistor is in the saturation region, and use: Vdd = 10V, Vss = -7V, Vg = -1.9V, Vt = 0.6V, and Von = 0.24. (Remember that Von = Vov = Vgs-Vt) Neglect the effect of channel-length modulation and body effect.



Answer: 13.7 ✔

Correct

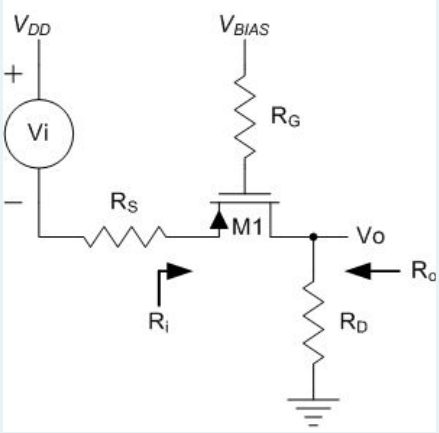
Marks for this submission: 6.00/6.00.

Question **25**

Correct

Mark 3.00 out of 6.00

What is the low frequency voltage gain for the amplifier shown at 27° C with Rd = 11.3kΩ, Rs = 2.4kΩ and Rg = 3.0kΩ ? Use: W/L = 57, Id = 199µA, VTP = -0.5V, k'p = 40µA/V^2. Neglect the effect of channel-length modulation and body effect.



Answer: 3.28 ✔

Correct

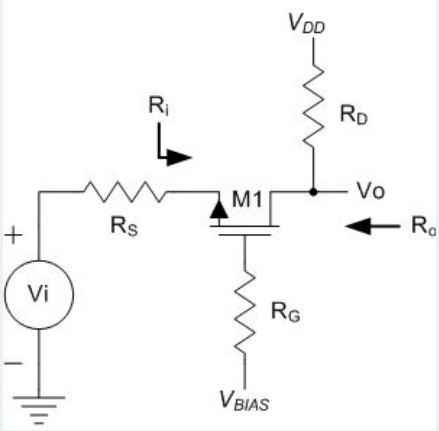
Marks for this submission: 6.00/6.00. Accounting for previous tries, this gives **3.00/6.00**.

Question **26**

Correct

Mark 6.00 out of 6.00

What is the low frequency voltage gain for the amplifier shown at 27° C with Rd = 48.7kΩ, Rs = 0.9kΩ and Rg = 1.2kΩ ? Use: W/L = 96, Id = 264µA, VTN = 0.5V, k'n = 100µA/V^2. Neglect the effect of channel-length modulation and body effect.



Answer: 36.23 ✔

Correct

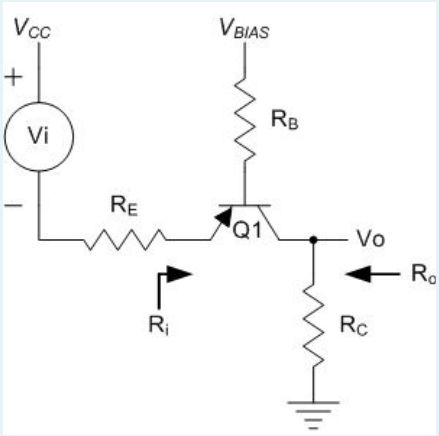
Marks for this submission: 6.00/6.00.

Question **27**

Correct

Mark 6.00 out of 6.00

What is the low frequency input resistance, Ri, in Ω for the amplifier shown at 27° C with Rc = 26.9kΩ, Re = 0.4kΩ and Rb = 0.3kΩ ? Use: Ic = 888μA, β = 15, and Vt = kT/q = 26mV. Neglect the effect of base-width modulation.



Answer: 46.2 ✔

Correct

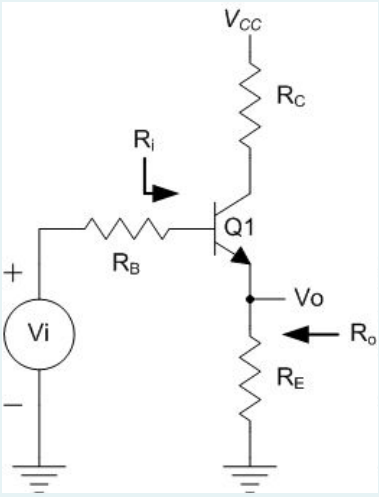
Marks for this submission: 6.00/6.00.

Question **28**

Correct

Mark 6.00 out of 6.00

What is the low frequency input resistance, Ri, in kΩ for the amplifier shown at 27° C with Rc = 44.0kΩ, Re = 0.1kΩ and Rb = 0.2kΩ ? Use: Ic = 862μA, β = 70, and Vt = kT/q = 26mV. Neglect the effect of base-width modulation.



Answer: 9.21 ✔

Correct

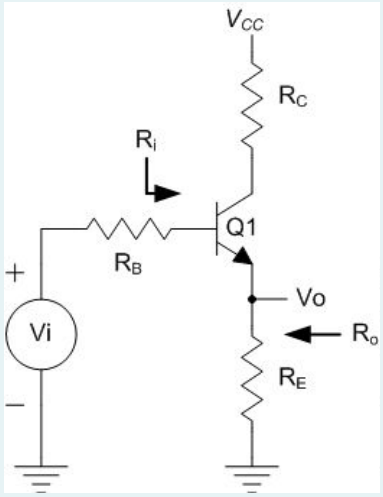
Marks for this submission: 6.00/6.00.

Question **29**

Correct

Mark 6.00 out of 6.00

What is the low frequency output resistance, Ro, in Ω for the amplifier shown at 27° C with Rc = 18.5kΩ, Re = 0.5kΩ and Rb = 0.5kΩ ? Use: Ic = 454μA, β = 186, VA = 50V, and Vt = kT/q = 26mV. Use the "short-cut approach" discussed in class, and neglect the effect of base-width modulation.



Answer: 53.3 ✔

Correct

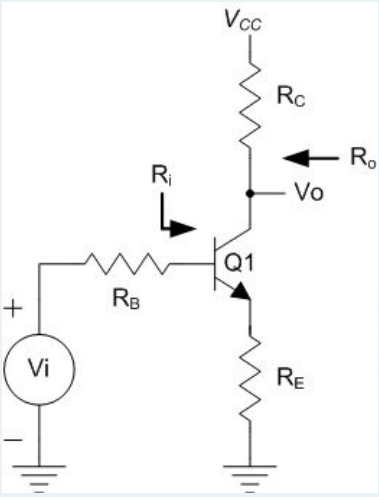
Marks for this submission: 6.00/6.00.

Question **30**

Correct

Mark 6.00 out of 6.00

What is the low frequency output resistance, Ro, in kΩ for the amplifier shown at 27° C with Rc = 40.5kΩ, Re = 0.4kΩ and Rb = 0.1kΩ ? Use: Ic = 549μA, β = 155, VA = 50V, and Vt = kT/q = 26mV. Use the "short-cut approach" discussed in class.



Answer: 38.7 ✔

Correct

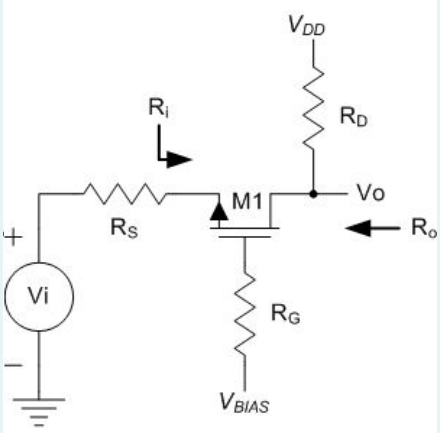
Marks for this submission: 6.00/6.00.

Question **31**

Correct

Mark 6.00 out of 6.00

Estimate the maximum low frequency voltage gain for the amplifier shown if the bias voltage across Rd is 1151mV and the bias voltage across Rs is 179mV.



Answer: 6.43 ✔

Correct

Marks for this submission: 6.00/6.00.

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