CMP1202: ELECTRONICS II

CAT#1

DATE: March 27, 2019 **DURATION: 1 HOUR**

SOLUTIONS

NAME: ______________________________

REGISTRATION NUMBER: ______________________________

STUDENT NUMBER: ______________________________

PROGRAMME (BSc.CMP I, II, E.T.C.): ______________________________

SIGNATURE: ______________________________

SOLUTIONS

1 **C**

2 **A**

3 **C**

4 **B**

5 **B**

6 **A**

7 **A**

8 **C**

9 **D**

10 **A**

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Instructions: *This paper consists of objective type questions. Write down the correct options for each question on the answer sheet provided. Write clearly. Marks will be deducted for poorly presented work.*

Constants: *Thermal voltage* $V_T = 25\ mV$,

$V_{BE} = 0.7\ V$

$V_{CEsat} = 0.2\ V$

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1) The following are properties of an ideal operational amplifier except:
   A) Infinite input impedance B) Infinite bandwidth
   C) Infinite closed loop gain D) Zero output impedance
2) The purpose of frequency compensation in operational amplifier circuits is to ensure that they:
   A) Are stable B) Oscillate
   C) Have an infinite bandwidth D) Do not need input bias currents

Refer to Figure 1 for questions 3 – 5.

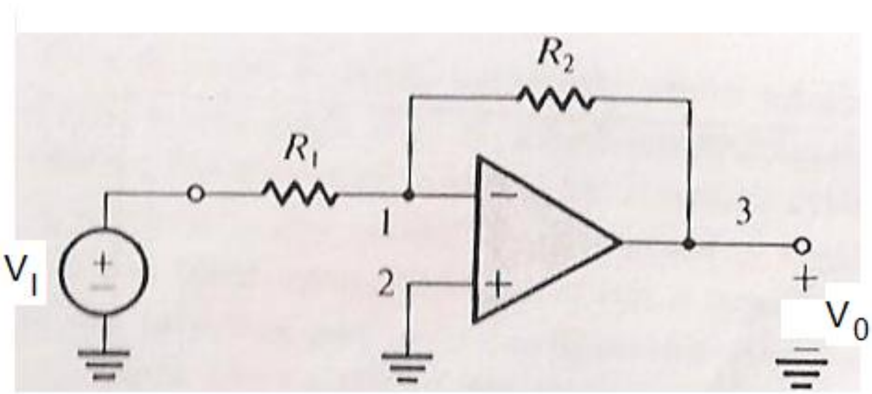

Figure 1

3) Using the circuit of Figure 1 and assuming an ideal operational amplifier, design an inverting amplifier with a voltage gain of 16.99 dB under the constraint of having to use resistors no larger than 10 MΩ.
   A) $R_1 =$ 100 kΩ, $R_2 =$ 5 MΩ B) $R_1 =$ 1 kΩ, $R_2 =$ 7 MΩ
   C) $R_1 =$ 1.4 MΩ, $R_2 =$ 10 MΩ D) $R_1 =$ 200 kΩ, $R_2 =$ 10 MΩ
4) What is the input resistance of your amplifier design in question 3?
   A) 10 MΩ B) 1.4 MΩ
   C) 200 kΩ D) 0
5) The circuit in Figure 1 can be converted into a miller integrator by replacing an element(s) as follows:

A) R_1 with a capacitor

B) R_2 with a capacitor

C) R_1 and R_2 with capacitors

D) R_2 with an inductor

6) A weighted summer circuit using an ideal operational amplifier has three inputs using 100 kΩ resistors and a feedback resistor of 50 kΩ. A signal v_1 is connected to two of the inputs while a signal v_2 is connected to the third. If $v_1 = 3$ V and $v_2 = -3$ V, what is v_o?

A) - 1.5 V

B) - 4.5 V

C) – 6 V

D) 1.5 V

7) One of the following statements is **TRUE**.

A) In the saturation region β for a transistor drops drastically.

B) The transconductance of a BJT is explicitly determined by the dimensions of the device

C) A CE amplifier can only give unit voltage and current gains

D) none

Refer to figure 2 for questions 8 - 10. Figure 2 shows a common emitter amplifier with d.c. collector current $I_c = 0.2$ mA, $\beta = 100$, $R_c = 47$ kΩ, $R_s = 100$ kΩ and a large early voltage V_A. Assume that the bypass capacitor C_E has a large value and therefore at signal frequencies of interest it presents a very small impedance.

8) Obtain the voltage gain Av = Vo/Vs.

A) 376 V/V

B) 32 V/V

C) – 41.8 V/V

D) - 46.4 V/V

9) Find the new voltage gain when the output of the amplifier is connected to a load resistor of 10 kΩ. (i.e. load resistor connected to collector)

A) – 6.6 V/V

B) - 42 V/V

C) – 8.14 V/V

D) – 7.33 V/V

10) The output resistance of the amplifier is:

A) 47 kΩ

B) 8.25 kΩ

C) 10 kΩ

D) none

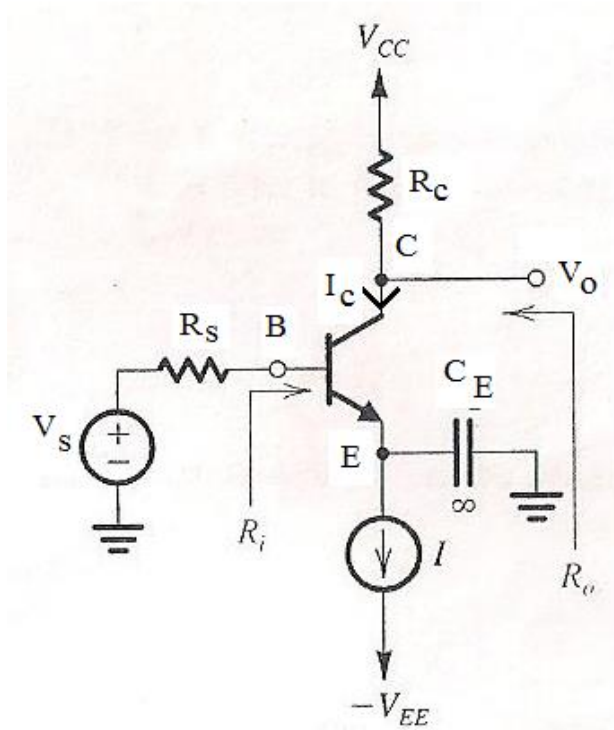

Figure 2

The End