Unit 3 - Week 1

Assignment 1

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

Due on 2020-02-12, 23:59 IST.

1) State whether the following statement is true or false. "The efficiency of a switching regulator can be lower than that of a linear regulator." *1 point*

- True
- False

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

2) State whether the following statement is true or false. "The temperature coefficient of the resistors used in a bandgap circuit must be zero so as to achieve a temperature-independent voltage reference." *1 point*

- True
- False

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

3) State whether the following statement is true or false. "The curvature in the output voltage of a bandgap reference circuit occurs mainly due to the non-linearity in the PTAT current." *1 point*

- True
- False

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

4) State whether the following statement is true or false. "Droop compensation cannot be used to improve the DC accuracy of a regulator." *1 point*

- True
- False

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

5) State whether the following statement is true or false. "Switching regulators offer high efficiency over a wide range of the conversion ratio V_O/V_{IN} because conduction losses depend on (V_{IN} - V_O)." *1 point*

- True
- False

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

6) State whether the following statement is true or false. "Linear regulators with a high dropout voltage are efficient when the load current is small." *1 point*

- True
- False

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

7) State whether the following statement is true or false. "Switching regulators are preferred in noise-sensitive applications." *1 point*

- True
- False

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

8) State whether the following statement is true or false. "The total power loss in a switching regulator operating at an efficiency of 93% with V_{IN} = 1.8 V, V_O = 1.5 V and delivering a load current of 1 A is 300 mW." *1 point*

- True
- False

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

9) State whether the following statement is true or false. "Droop compensation calls for the output to be regulated slightly above the required value at full load." *1 point*

- True
- False

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

10) A power management module comprises two regulators with the following specifications. Both regulators operate from a common supply voltage of 1.8 V.
Regulator 1: Linear, V_O = 1.5 V, I_{LOAD} = 500 mA, η = 83.3%
Regulator 2: Switching, V_O = 1.5 V, I_{LOAD} = 1 A, η = 90%
Fill in the blank with a numerical answer: The total efficiency of the above power management module is η = _______ %
(up to 2 decimal places).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 86.78,88.54

2 points

Consider the circuit shown in Figure 1 for questions 11 and 12. Assume that M_{P1} , M_{P2} and M_{P3} are identical MOSFETs with $r_{ds} \to \infty$. Assume also, that Q_1 , Q_2 are BJTs with $\beta \to \infty$ and an emitter area ratio of 1: m.

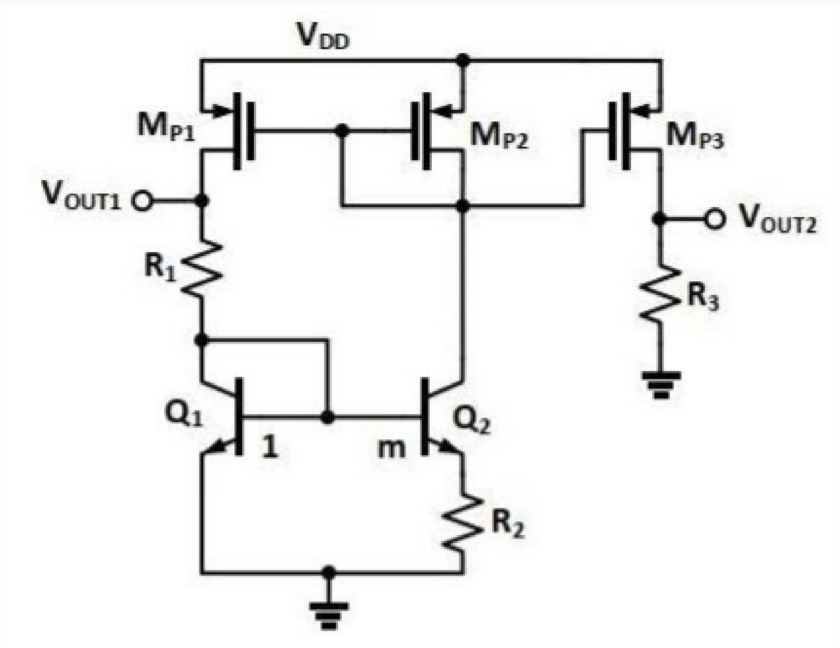

Figure 1

11) What is the expression for V_{OUT1} (in respect of the circuit shown in Figure 1)? *1 point*

- $V_{OUT1} = V_{BE2} + (R_2 /R_1)\ V_T \ln(1/m)$
- $V_{OUT1} = V_{BE1} + (R_2 /R_1)\ V_T \ln(m)$
- $V_{OUT1} = V_{BE1} + (R_1 /R_2)\ V_T \ln(m)$
- $V_{OUT1} = V_{BE2} + (R_2 /R_1)\ V_T \ln(m)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$V_{OUT1} = V_{BE1} + (R_1 /R_2)\ V_T \ln(m)$

12) What is the expression for V_{OUT2} (in respect of the circuit shown in Figure 1)? *1 point*

- $V_{OUT2} = (R_3 /R_1)\ V_T \ln(1/m)$
- $V_{OUT2} = (R_3/R_2)\ V_T \ln(m)$
- $V_{OUT2} = (R_2 /R_3)\ V_T \ln(m)$
- $V_{OUT2} = (R_2 /R_1)\ V_T \ln(1/m)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$V_{OUT2} = (R_3/R_2)\ V_T \ln(m)$

Consider the circuit shown in Figure 2 for questions 13 and 14. It was designed to get a constant V_{OUT} across temperature with the following parameters.

V_{DD} = 1.8 V, R_1 = 6 kΩ, $r_{ds} \to \infty$ for M_{P1} and M_{P2}, V_{EB1} = 0.7 V, dV_T /dT = 0.1 mV/K, V_T = 26 mV and dV_{EB} /dT = -2 mV/K.

Assume that M_{P1} and M_{P2} are perfectly matched and that the area of Q_2 is 20 times that of Q_1 . Adhere to the units mentioned in the question while filling in numerical answers.

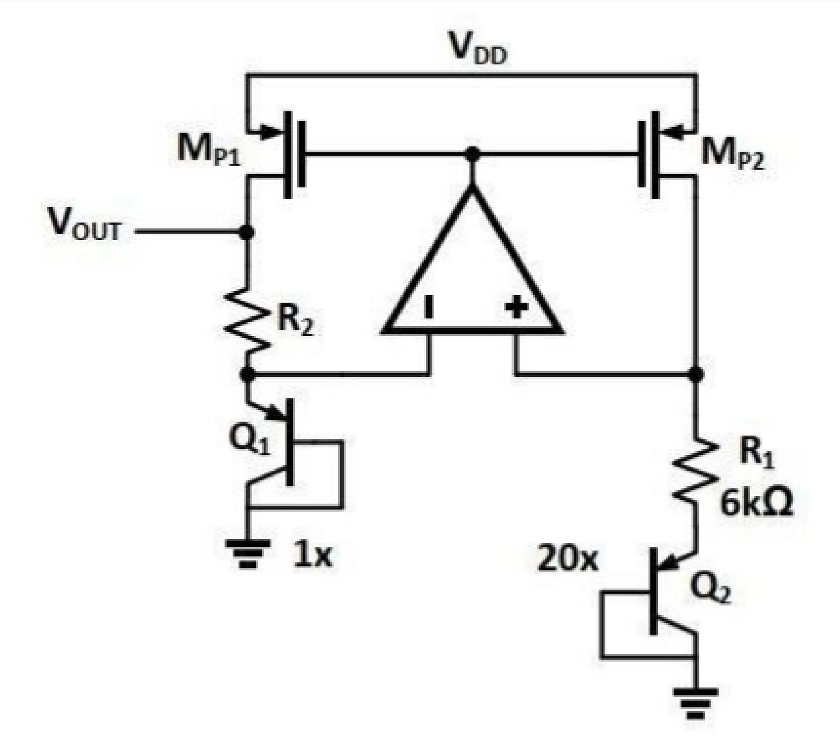

Figure 2

13) Fill in the blank with a numerical answer: The value of R_2 (in respect of the circuit shown in Figure 2) that is required to obtain a constant and temperature-independent V_{OUT} is ____ kΩ (up to 1 decimal place).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 39.5,40.5

2 points

14) Fill in the blank with a numerical answer: The value of R_2 (that was obtained in question 13) gives the value of V_{OUT} to be ____ volt (up to 2 decimal places).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 1.2,1.24

1 point