Input & Output Limitations – 2
Multiple Choice Quiz
TI Precision Labs – Op Amps
Quiz: Input & Output Limitations – 2

1. Single supply amplifiers have _____________.
   a. Common mode range that extends to the negative supply.
   b. Common mode range that extends to the positive supply.

2. (T/F) Single supply amplifiers can be used in a dual supply configuration.
   a. True
   b. False

3. (T/F) The common mode range of an amplifier is limited by the saturation and cutoff voltages of transistors in the input stage.
   a. True
   b. False

4. (T/F) Most rail-to-rail amplifiers use bipolar transistors.
   a. True
   b. False
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5. What is a potential issue associated with using a charge pump to power the input stage on an op amp?
   a. The charge pump can create crossover distortion.
   b. The charge pump will cause a significant increase in the device quiescent current.
   c. The charge pump requires external components.
   d. Charge pump switching noise can introduce errors.

6. Consider the CMRR specification below. Does this device have crossover distortion?
   a. Yes.
   b. No.

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**ELECTRICAL CHARACTERISTICS: \( V_S = +1.8 \, \text{V to} \, +5.5 \, \text{V} \)**

At \( T_A = +25^\circ \text{C} \), \( R_L = 10 \, \text{k}\Omega \) connected to \( V_S / 2 \), \( V_{CM} = V_S / 2 \), and \( V_{OUT} = V_S / 2 \), unless otherwise noted.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT VOLTAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( V_{CM} ) Common-mode voltage range</td>
<td>((V-) - 0.1 ) \leq V_{CM} \leq (V+) + 0.1 V, ( T_A = -40^\circ \text{C to} , +125^\circ \text{C} )</td>
<td>106</td>
<td>130</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>CMRR Common-mode rejection ratio</td>
<td></td>
<td></td>
<td></td>
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7. Which of the following will **NOT** minimize crossover distortion on rail to rail amplifiers?
   a. Use an internal charge pump to boost the supply on the input stage
   b. Use external TVS diodes to minimize the distortion.
   c. Use a zero drift amplifier to minimize the overall offset so that the offset shift is small.

8. Consider the CMRR specification below. Does this device have crossover distortion?
   a. Yes.
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</tr>
<tr>
<td>Common-Mode Voltage Range</td>
<td>−0.3V &lt; V&lt;sub&gt;CM&lt;/sub&gt; &lt; (V+) − 1.8V</td>
</tr>
<tr>
<td>Common-Mode Rejection Ratio</td>
<td>V&lt;sub&gt;S&lt;/sub&gt; = 5V, −0.3V &lt; V&lt;sub&gt;CM&lt;/sub&gt; &lt; 5.3V</td>
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<td>V&lt;sub&gt;S&lt;/sub&gt; = 2.7V, −0.3V &lt; V&lt;sub&gt;CM&lt;/sub&gt; &lt; 3V</td>
</tr>
<tr>
<td></td>
<td>MIN                         TYP&lt;sup&gt;(1)&lt;/sup&gt;                  MAX</td>
</tr>
<tr>
<td>OPA343NA, UA</td>
<td>−0.3                       74                        92</td>
</tr>
<tr>
<td>OPA2343EA, UA</td>
<td>60                         75</td>
</tr>
<tr>
<td>OPA4343EA, UA, NA</td>
<td>54                         70</td>
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<td>UNITS</td>
<td>V                          dB</td>
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Multiple Choice Quiz: Solutions
TI Precision Labs – Op Amps
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