Assignment 6

Due on 2020-10-29, 03:58 HST.

Use the data given below for Question 1 - 6

<table>
<thead>
<tr>
<th>V</th>
<th>V1</th>
<th>V2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>0.048</td>
<td>1.34</td>
</tr>
<tr>
<td>1.3</td>
<td>0.037</td>
<td>1.55</td>
</tr>
<tr>
<td>1.4</td>
<td>0.032</td>
<td>1.75</td>
</tr>
<tr>
<td>1.5</td>
<td>0.026</td>
<td>1.95</td>
</tr>
<tr>
<td>1.6</td>
<td>0.026</td>
<td>2.15</td>
</tr>
<tr>
<td>1.7</td>
<td>0.023</td>
<td>2.35</td>
</tr>
<tr>
<td>1.8</td>
<td>0.019</td>
<td>2.54</td>
</tr>
<tr>
<td>1.9</td>
<td>0.018</td>
<td>2.74</td>
</tr>
<tr>
<td>2.0</td>
<td>0.017</td>
<td>2.94</td>
</tr>
</tbody>
</table>

Table 1: Wavelengths V1 and V2 with V

1. Find matrix dispersion, waveguide dispersion and total dispersion and at λc = 1550 nm. Given, $n_1 = 1.5$, $n_2 = -0.01$ ps/nm/km, $n_3 = -0.004$ ps/nm^2/km, where n is the refractive index of pure silica. You can refer Table 1 for other parameters. Note: Choose the closest V value from the table.
   - [1 point]

2. Find corresponding $V_j$ at 1550 nm.
   - [1 point]

3. Find the accumulated dispersion per km in this fiber if lengths 150 km, while operating at 1550 nm.
   - [1 point]

4. Find the accumulated dispersion for a 10 Gbps NZF system at 1546 nm wavelength for the fiber defined at Question 3.
   - [1 point]

5. What is the value of the dispersion parameter to compensate the accumulated dispersion for the fiber described in Question 3 if the distance is 15.41 km for a Dispersion Compensation Fiber (DCF) of fiber length 6 km.
   - [1 point]

6. Estimate solutions to Question 5 for a 15 Gbps NZF system.
   - [1 point]

7. A dense wavelength Division Multiplexing (DWDM) transceivers system has a channel spacing of 100 Gs. Find the number of channels that can be transmitted in 10 Gbps, which is the base rate for DWDM channels. How many channels can be transmitted sequentially from the lowest wavelength to highest possible wavelength? Write the wavelength spacing between two adjacent channels.
   - [1 point]

8. Given DWDM transmission at 100 Gbps for all fiber types. Find the phase relationships for the generation of the highest frequency center channel for a WDM channel spacing for 62.5 Gbps and 50 Gbps. Write the wavelength spacing between two adjacent channels.
   - [1 point]

9. The acceptable loss value over a spectral region extending from 1.3 to 1.5 μm. Estimate the capacity of a WDM system covering this entire region.
   - [1 point]

10. The C-band spectral bands cover a wavelength range from 1530 to 1565 μm.
    - [1 point]

11. How many channels can be transmitted through WDM when the channel spacing is 20 nm?
    - [1 point]