In the name of beauty

The 8th problem set solution of Optical Networks course

* 1. In dedicated protection scheme, a specific backup path is always guaranteed to exist for any connection such that a fast switching between working and protection paths is always possible in case a failure occurs in the working path (both the working and protection paths can simultaneously be active when 1+1 protection is deployed).
  2. Path protection is fault-independent as it does not rely on the exact place where failure occurred in the working path. In this scheme, a node-disjoint protection path is calculated for the main connection. Link protection, as the name suggests, is fault-dependent and routes the traffic alternatively over a detour path around the brought-down link.

1. In path protection, e.g. path 1-4-7-8 can be reserved for protection with 3 hops; link protection may give us the 1-2-6-5-8 path with 4 hops and segment (or sub-path) protection can lead to either 1-3-6-5-8 with 4 hops (in case the segment 1-2-5 is protected) or 1-2-6-8 with 3 hops (in case the segment 2-5-8 is protected). The path protection however, leads to a smaller number of hops compared to segment or link protection, but the exact solution is generally dependent on the network physical topology.
2. In case only one of the paths p1 to pN brings down, the backup path b1 can recover the failure, but with more than one paths collapsing, the shared protection scheme fails to obtain a solution. The probability of such a defect to show up is:
3. The working and protection paths are A-B-C-D-Z and A-E-F-G-H-Z. There are 11 links in total with total cases of 2-link failures. The connection does not survive if a link per each of the working and protection paths goes down, which is possible in different ways as there are 4 and 5 links in working and protection paths, respectively. Hence, the number of cases in which the connection survives, is .
4. As we are constrained to a wavelength in both working and protection paths of a same service, we define each node of the path graph to represent both the paths.

