Name: _____

Optical Communication Networks—CSCE 953

Homework 2B [130 pts.]

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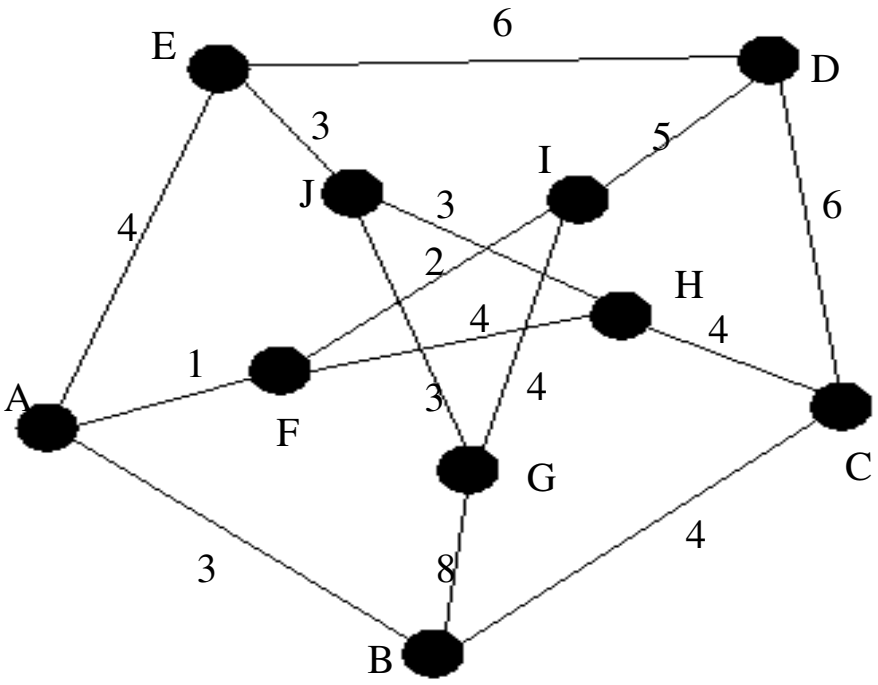
1. (**25 points**)
   Create a new topology of your choice and simulate the First Fit and Random Wavelength Assignment schemes along with Shortest Path Routing using the SIMON Simulator. Please plot the results as (Network) Blocking Probability versus Load. Please note
   Your topology should have at least 10 nodes and 15 links. Please do not share your topology with others
   Your plots should have at least 5 data points for each curve (FF and R) - so please choose a variety of Loads.
   You can use the same number of wavelengths for each simulation.
   No programming is needed for this. You simply need to edit the Parameters and Topology files.

(b) (**20 points**) Formulate an MILP problem and solve it using lp_solve. Your formulation should have at least 5 variables and 10 constraints.

2. (**25 points**)

(a) (**10 points**) For the Petersen graph shown below, determine the k-shortest paths between nodes A and D when k = 3. Show your work.



(b) (**15 points**) For the same graph above, using Suurballe's algorithm, compute the minimum cost edge-disjoint pair of paths between nodes A and D. Show your work.

3. (**25 points**)

(a) (**5 points**) What is the key difference between protection and restoration schemes in optical WDM networks?

(b) (**10 points**) What is the condition under which backup multiplexing (combined with path protection) is guaranteed to protect all connections against single-link failures?

(b) (**10 points**) Give two advantages each for WDM-layer protection and IP-layer restoration schemes in IP over WDM networks.

4. (**25 points**) Distinguish between network architectures with full wavelength conversion, sparse wavelength conversion, limited-range wavelength conversion and share-per-node wavelength conversion.

5. (**30 points**) Consider the network topology of Figure below. Each link has four wavelengths. The set of links on which each of the wavelengths is available is given by:
   $\lambda_0 : l_1, l_4, l_7$
   $\lambda_1 : l_4, l_5, l_6$
   $\lambda_2 : l_2, l_4, l_5, l_6, l_7$
   $\lambda_3 : l_2, l_3, l_5, l_7$
   The set of alternate route for the node pair (A, D) is $\{(l_1 - l_7 - l_4), (l_6 - l_5 - l_4), (l_1 - l_2 - l_3)\}$.

   - Compute the route and wavelength assignment for node pair (A, D) using Fixed Alternate Routing and First Fit, Most Used and Least Used wavelength assignment techniques.

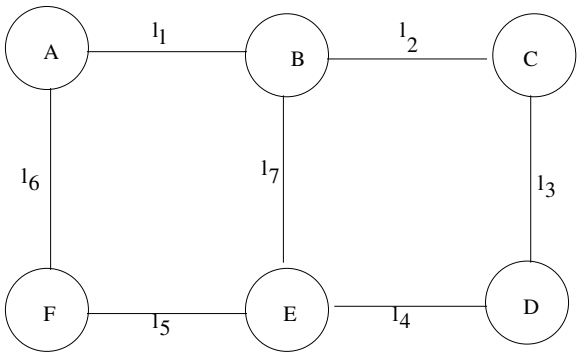


Figure 1: Network Topology

The End