Second Repeat of the Second Midterm Test

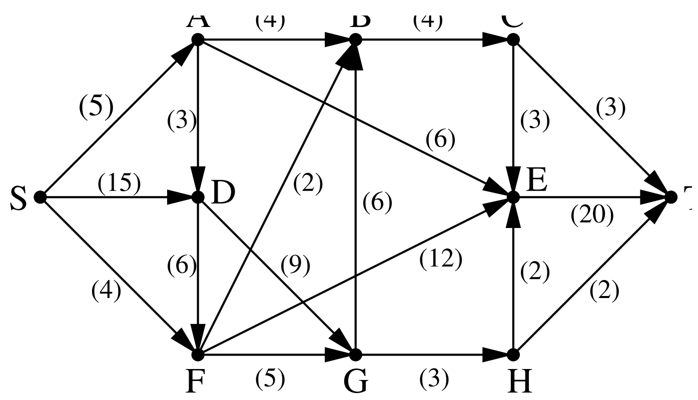
1. Let G_1 be the graph obtained from a convex 25-sided polygon by adding all the diagonals starting from one vertex (22 of them). Let G_2 be the graph obtained from a 25-sided polygon by adding a new vertex and connecting it to all the vertices of the polygon. Determine whether G_1 and G_2 are interval graphs or not.

2. Let the vertices of the graph G be $v_1, v_2, \ldots, v_{100}$, and let v_i and v_j $(i \neq j)$ be adjacent if and only if ij is divisible by 4. Does G contain a perfect matching?

3. Let G be a graph on 100 vertices which has no isolated vertices, and $\nu(G) = \chi(G) = 2$. Determine $\alpha(G)$.

4. Let the vertices of the graph G be $v_{i,j}$, $1 \leq i, j \leq 4$ (so G has 16 vertices). Let the vertices $v_{i,j}$ and $v_{k,l}$ be adjacent if and only if $|i - k| = 1$ or 3. Determine $\chi_e(G)$, the edge-chromatic number of the graph G.

5. Determine a maximum flow in the network below (from S to T).



6. Determine the minimum number of edges over all simple graphs G on 6 vertices for which $\kappa(G) = 2$ holds. ($\kappa(G)$ is the vertex-connectivity number of G.)

Total work time: 90 min.
The full solution of each problem (including explanations) is worth 10 points. Show all your work! Results without proper justification or work shown deserve no credit.
Notes and calculators (and similar devices) cannot be used.
Grading: 0-24 points: 1, 25-33 points: 2, 34-42 points: 3, 43-51 points: 4, 52-60 points: 5.