

### AMS 303 Homework #5 ApComb Chapter 9

9.1: 5 c)  $\left( \begin{array}{c} C_1 C_2 C_3 C_4 C_5 C_6 C_7 C_8 C_9 C_{10} C_{11} C_{12} C_{13} C_{14} C_{15} C_{16} \\ C_1 C_3 C_2 C_5 C_4 C_6 C_9 C_8 C_7 C_{11} C_{10} C_{15} C_{14} C_{13} C_{12} C_{16} \end{array} \right)$ ; 10b)  $\pi_7$ , c)  $\pi_2$ ,

9.2: 3  $\cdot \frac{1}{3}(3^{15} + 2 \times 3^5)$ ; 4  $\cdot \frac{1}{4}(2^{64} + 2 \times 2^{16} + 2^{32})$ ; 10  $\cdot \frac{1}{2}(3 \times 2^{n-1})$ ,  $n$  even,

$\frac{1}{2}(3 \times 2^{n-1} + 3 \times 2^{(n-1)/2})$

9.3: 4a) 315, c) 5934; 5d)  $\frac{1}{4}(m^8 + 3m^4)$ , e)  $\frac{1}{12}(m^7 + 2m^2 + 2m^3 + 4m^4 + 3m^5)$ ,

7d)  $\frac{1}{4}(m^{10} + m^5 + m^6 + m^7)$ , e)  $\frac{1}{12}(m^{12} + 2m^2 + 2m^4 + m^6 + 6m^7)$ ;

9.4: 2b)  $\frac{1}{9}\{(b+w)^9 + 6(b^9 + w^9) + 2(b^3 + w^3)^3\}$ , 10, c)  $\frac{1}{10}\{(b+w)^{10} + 4(b^{10} + w^{10}) + 4(b^5 + w^5)^2 + (b^2 + w^2)^5\}$ , 12,

7d)  $\frac{1}{4}\{(b+w)^{10} + (b^2 + w^2)^5\} + (b+w)^2(b^2 + w^2)^4 + (b+w)^4(b^2 + w^2)^3$ , e)  $\frac{1}{12}\{(b+w)^{12} + 2(b^6 + w^6)^2 + 2(b^3 + w^3)^4 + (b^2 + w^2)^6 + 6(b^2 + w^2)^5(b+w)^2\}$ , 9a)  $\frac{1}{12}\{(b+w)^4 + 8(b^3 + w^3)(b+w) + 3(b^2 + w^2)^2\}$ ,

9b)  $\frac{1}{24}\{(b+w)^6 + 6(b^4 + w^4)(b+w)^2 + 3(b^2 + w^2)^2(b+w)^2 + 6(b^2 + w^2)^3 + 8(b^3 + w^3)^2\}$ ;

### Homework #6, ApComb Chapter 4

4.3: 2a) max flow = 19,  $P = \{a, b, d\}$ , b) max flow = 24,  $P = \{a, b, c\}$ , 3. max flow = 50,

$\bar{P} = \{f, z\}$ ; 6. yes, build successive flow paths by choosing leftmost unsaturated edge

leaving each vertex; 8a) not possible, cut with  $P = \{a, b, c, d, e, g\}$  has capacity 50, b) now

possible; 9. 5, build paths by choosing leftmost unused edge leaving each vertex;

12. split  $b, c, d$  each into 2 vertices, one  $x_i$  for incoming edges and one  $x_o$  for outgoing

edges with an edge of cap. 5 joining the 2 vertices; max flow = 12,  $P = \{a, b_i, b_o, c_i, c_o, d_i,$

$e\}$ , 21. define tree with a vertex's parent being its first label;

4.4: 2a) several possibilities, b)  $E-a^+, e-E^+, f-E^+, A-e^-, D-f^-, a-A^+, c-A^+, d-D^+, z-a^+$ ;

new matching:  $A-c, B-b, C-a, D-f, E-e$ ; 4.  $A - B_i \& G, B_o - F \& G, C - F \& J, D - B_i \&$

$La, L_o - J \& La$ ; 5. no, schools with demand of 7 Ph.D.'s can only hire at most 6 (one

from each univ.) 8. Only possible to be co-champions, jointly with the other three teams.

4.5: 4a)  $x_{11} = 10, x_{12} = 20, x_{22} = 20, x_{23} = 10, x_{31} = 30$ , b)  $x_{12} = 30, x_{21} = 20, x_{22} = 10, x_{31} =$

$20, x_{33} = 10$ ; 5a)  $x_{13} = 30, x_{21} = 20, x_{23} = 10, x_{32} = 20, x_{33} = 10$ , b)  $x_{12} = 20, x_{13} = 10, x_{21} = 20,$

$x_{23} = 10, x_{33} = 30$ ; 6a)  $x_{12} = 10, x_{13} = 30, x_{21} = 30, x_{31} = 20, x_{33} = 10, x_{34} = 20$ , b)  $x_{13} = 40,$

$x_{21} = 30, x_{31} = 20, x_{32} = 10, x_{34} = 20$ ;