

**CEN6070 – Software Verification, Fall 2008**

**Homework #5** (10 points), **Due** Nov. 11 (Tuesday)

1. (8 points) Given a state transition system  $M = (S, T, L)$ , where  $S = \{s_1, s_2, s_3, s_4, s_5\}$ ,  $T = \{a\}$  with  
 $a = \{(s_1, s_2), (s_2, s_3), (s_2, s_4), (s_3, s_1), (s_3, s_1), (s_4, s_5), (s_5, s_4)\}$ , and  
 $L = \{(s_2 \mapsto p), (s_3 \mapsto q)\}$   
Evaluate the following  $\mu$ -calculus formulas:  
(1)  $\mu Z. p \vee [a]Z$   
(2)  $\nu Z. (p \wedge \langle a \rangle (\mu Y. (Z \wedge q) \vee (p \wedge \langle a \rangle Y)))$
2. (2 points) Translate the CTL formula  $\mathbf{AG}(p \wedge \mathbf{E}[q\mathbf{U}r])$  into an equivalent  $\mu$ -calculus formulas.