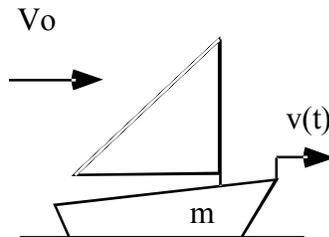**Problem 2 (20 points)**

A sailing ship of mass, m , is initially at rest, i.e. $v(0) = 0$ . At time t = 0, a strong wind arises of magnitude

$V_o = 10\text{m/s}$



Assume that the force of the wind on the sails in the direction of travel is given by

$F_w(t) = B_w[V_o - v(t)]$

Assume that the viscous drag of the water on the ship is given by

$F_b(t) = B_d v(t)$

a) Formulate a differential equation that describes the ship's velocity, $v(t)$.

b) Solve the differential equation from a) and write an expression for the ship's velocity, $v(t)$ .

c) Sketch the response, $v(t)$.

d) Write an expression for the steady-state velocity, $v_{ss}$ , in terms of system parameters.