**Homework # 7 (Lectures 14. 15, 16) Due November 4, 2010**

1. Why can't the physical equations at the local scale (~1m) be used to describe the three runoff- generation mechanisms at the hillslope scale (~$10^2$ m)? Be specific but brief in listing and explaining the physical reasons in your answer.                (3)

2. Derive Eq. (15.3) from the mass conservation Eq. (15.2) pertaining to Clark's unit hydrograph.                                              (2)

3. Consider the channel network shown in Fig. 15.4b (Lecture 15). Let $v$=0.1 m/s be the travel time for each link, $\Delta t = 0.25\ hr$, link length = $vt$ = 90 m, and K=30 hr. Use Eq. (15.3) to compute Clark's IUH and verify your result given in Fig. 15.5.            (2)

4. Consider the representation of stream discharge in Kirkby (1976) given in Eq. (16.3).
    (i) Give the physical assumptions under which Eq. (16.3) reduces to Eq. (16.4), and give a derivation. Then obtain Eq. (16.5) from (16.4). Show your steps.  (2)
    (ii) Give a physical interpretation to the storage-discharge relation in Clark's hydrograph in terms of physical processes used in Kirkby.                (1)