Problem #1

A trapezoidal irrigation canal has a bottom width of 4 ft, side slope of m = 2, and a longitudinal bottom slope of 0.0005. A rectangular sharp-crested weir placed in this canal has a crest height of 2.30 ft and a crest length of 2.6 ft. Another weir of the same characteristics is placed in the canal some distance downstream. The water surface elevation at the approach section is 2.5 ft and 2.35 ft above the crest for the upstream and downstream weirs, respectively. Determine the rate of loss of water due to seepage in the canal between the two weirs.

Problem #2

A circular concrete culvert has a diameter of 1.5 m, bottom slope 0.01 and length 30 m. The culvert inlet is grooved with a headwall and is not mitered. Determine the maximum discharge this culvert can convey under inlet control conditions if the headwater depth is not to exceed 2.3 m.

Problem #3

A corrugate metal pipe culvert has a length of 120 ft, slope of 0.001, roughness factor of 0.024, and diameter of 3 ft. The inlet is projected from fill with no headwall. The tailwater depth is 1.0 ft. The flow is controlled by the outlet. Determine the headwater depth for discharge of 40, 60, and 80 cfs. Can this culvert carry 80 cfs if the headwater depth is not to exceed 8 ft?

Problem #4

A 100-ft long horizontal concrete pipe culvert, that has a Manning roughness coefficient of 0.012, is to be sized to carry 35 cfs. The tailwater depth is 3.5 ft. The inlet will be square-edged, and the headwater depth is not to exceed 4.5 ft. Assume the culvert will flow full and that outlet control conditions apply. Determine if a 36-in or a 33-in pipe will be suitable for your site. Check, if your assumption of full flow in the culvert has been met.