**CE 374K Hydrology, Spring 2013**

**Review for First Exam**

The material is classified according to ***Bloom’s Taxonomy of Educational Objectives***:

|  |  |  |
| --- | --- | --- |
| **Level** | **Title** | **Meaning** |
| 1 | Knowledge | Definitions, facts, formulas |
| 2 | Comprehension | Explanation of definitions, formulas, problem solving procedures |
| 3 | Application | Know how to use a formula or procedure to solve simple problems |
| 4 | Analysis | Break down a complex problem and solve by steps |
| 5 | Synthesis | Derivation of basic formulas, design of new systems |
| 6 | Evaluation | Advantages and limitations of alternative approaches |

**Lectures**

|  |  |  |
| --- | --- | --- |
| **Lecture** | **Topic** | **Leve**l |
| 1 | Introduction to surface water hydrology, hydrologic cycle | 2 |
| 2 | Hydrologic systems and continuity equation | 5 |
| 3 | Mass, momentum, energy | 3 |
| 4 | Atmospheric water | 4 |
| 5 | Precipitation | 4 |
| 6 | Evaporation | 5 |
| 7 | Soil water | 3 |
| 8 | Infiltration by Green-Ampt method | 5 |
| 9 | Runoff volume, SCS method | 3 |
| 10 | Hydrologic measurement | 2 |

**Readings: Applied Hydrology**

|  |  |  |
| --- | --- | --- |
| **Source** | **Topic** | **Level** |
| Chap 1 | Introduction to hydrology | 2 |
| Sec 2.1 | Reynolds transport theorem,  | 2 |
| Sec 2.2-2.3 | Continuity equation | 5 |
| Sec 2.5 | Open channel flow | 3 |
| Sec. 2.4,2.6 | Momentum principle, flow in porous media | 3 |
| Sec. 2.7-2.8 | Energy balance | 4 |
| Sec. 3.1 | Atmospheric circulation | 2 |
| Sec. 3.2 | Water vapor | 5 |
| Sec. 3.3 | Precipitation | 3 |
| Sec. 3.4 | Rainfall | 4 |
| Sec. 3.5 | Evaporation | 5 |
| Sec. 3.6 | Evapotranspiration | 4 |
| Sec. 4.1 | Unsaturated flow | 3 |
| Sec. 4.2 | Infiltration | 2 |
| Sec 4.3-4.4 | Green-Ampt Method | 5 |
| Sec 5.1 – 5.3 | Runoff processes | 2 |
| Sec 5.4 – 5.5 | Abstractions using infiltration equations | 3 |
| Sec 6 | Hydrologic measurement | 2 |

  You may bring a review sheet 8/5 x 11 inches with you with anything on it on both sides of the paper that you want.

 **Technical skills expected:**

1. Calculate the water balance over a watershed given precipitation and streamflow data.
2. Compute the flow in a river channel by Manning’s equation and in a column of porous media by Darcy’s equation.
3. Compute the emitted long-wave radiation from a land surface and the net radiation given the incoming short-wave solar radiation.
4. Given the air temperature, humidity and air pressure, compute the saturated vapor pressure, actual vapor pressure, specific humidity and the dew point temperature.
5. Obtain the maximum precipitation intensity as a function of duration from the precipitation hyetograph.
6. Determine the mean annual rainfall over a region using arithmetic average and thiessen polygon methods.
7. Given the radiation and heat fluxes, at the land surface, compute and interpret the surface energy balance.
8. Given the net radiation, temperature, wind speed and relative humidity, determine the potential evaporation rate.
9. Be able to convert latent heat flux to evaporation rate, and vice versa, and determine the proportion of the potential evaporation that actually evaporates.
10. Given the % of sand, silt and clay in a soil sample, locate that soil in the soil texture triangle.
11. Determine the infiltration rate and the cumulative infiltration by the Green-Ampt method (assume values from the soil parameters table are supplied).
12. Determine the ponding time and the time needed to infiltrate a known amount of water into the soil after ponding occurs.
13. Determine the amount of runoff from a given amount of rainfall using the SCS method (assume CN and % impervious are given).

There will be five questions on the exam:

1. Two level 1-2 questions of the “Define, explain, illustrate with a diagram” type that cover basic concepts, definitions and equations. These questions will come from any part of the course.
2. Two level 3-4 questions with numerical answers drawn from the list above.
3. One level 5 question that requires a theoretical development (ie the answer is a formula not a number) drawn from the sections labeled 5 in the lectures and readings.