

Utah State University
Department of Civil and Environmental Engineering
CEE7430 Physical Hydrology

Midterm Test.
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Date: 2/26/09
Time: 1 hr 15 min
Total: 40 points

Please answer on separate sheets of paper. This is an open book/open notes test. You may use a programmable calculator but not a computer. There are 4 questions. Answer all questions.

1. Consider the following stochastic time series model [10 points]

$$X_t = 0.7 X_{t-1} + 0.6 W_t$$

where W_t is an independent normal, $N(0,1)$, random process. Calculate the mean and variance of X_t . Plot the autocovariance (not autocorrelation) function of X_t out to lag 3.

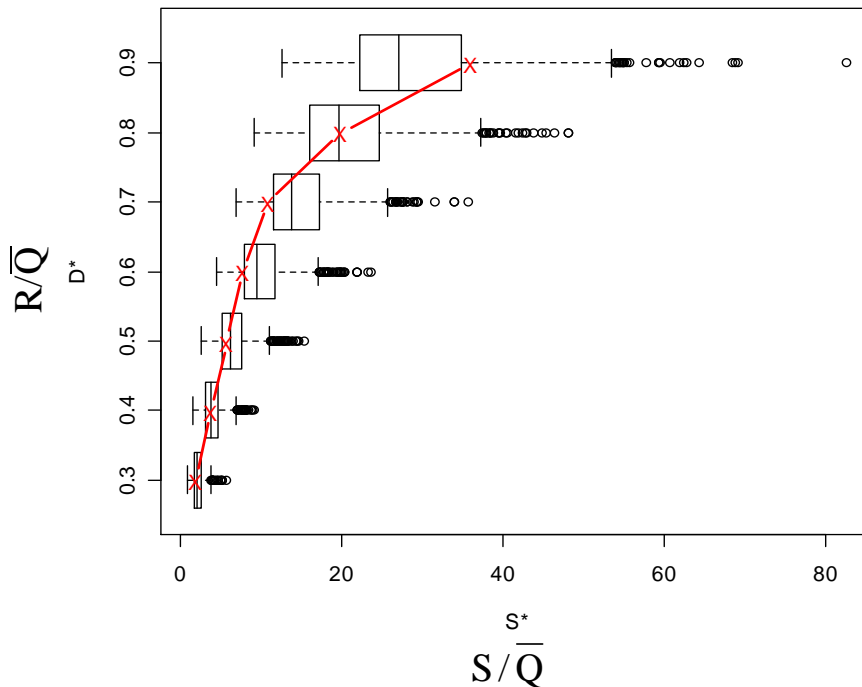
2. Consider the following stochastic time series model [10 points]

$$Q_t = 5 + a_t + 0.6 a_{t-1}$$

where a_t is an independent normal, $N(0,1)$, random process. Calculate the mean and variance of Q_t . Plot the autocorrelation(yes autocorrelation this time) function of Q_t out to lag 3.

3. Given the following Storage-yield plot from a slide given in class

Reservoir Storage-Yield Analysis



Assume that this pertains to a river where the mean monthly flow is 8 KAF (KAF = thousand acre feet) and that this graph was derived from simulations 60 years long, during which the recorded minimum monthly flow was 0.4 KAF. Simulations have approximated the monthly flows as coming from a log-normal distribution. Assume that a water resources system has a need for a steady yield of 5.6 KAF from this river. What size reservoir is required to supply this need with 75% reliability? Read values off the graph to obtain your solution. Please hand in a marked up graph showing the values you read in deriving your answer. Report your answer in KAF. Explain in precise terms what 75% reliability means in the context of this information and the answer you have given. [10 points]

4. Given the following plots identify the type of ARMA process and estimate the parameters that you have sufficient information to estimate. [10 points]

