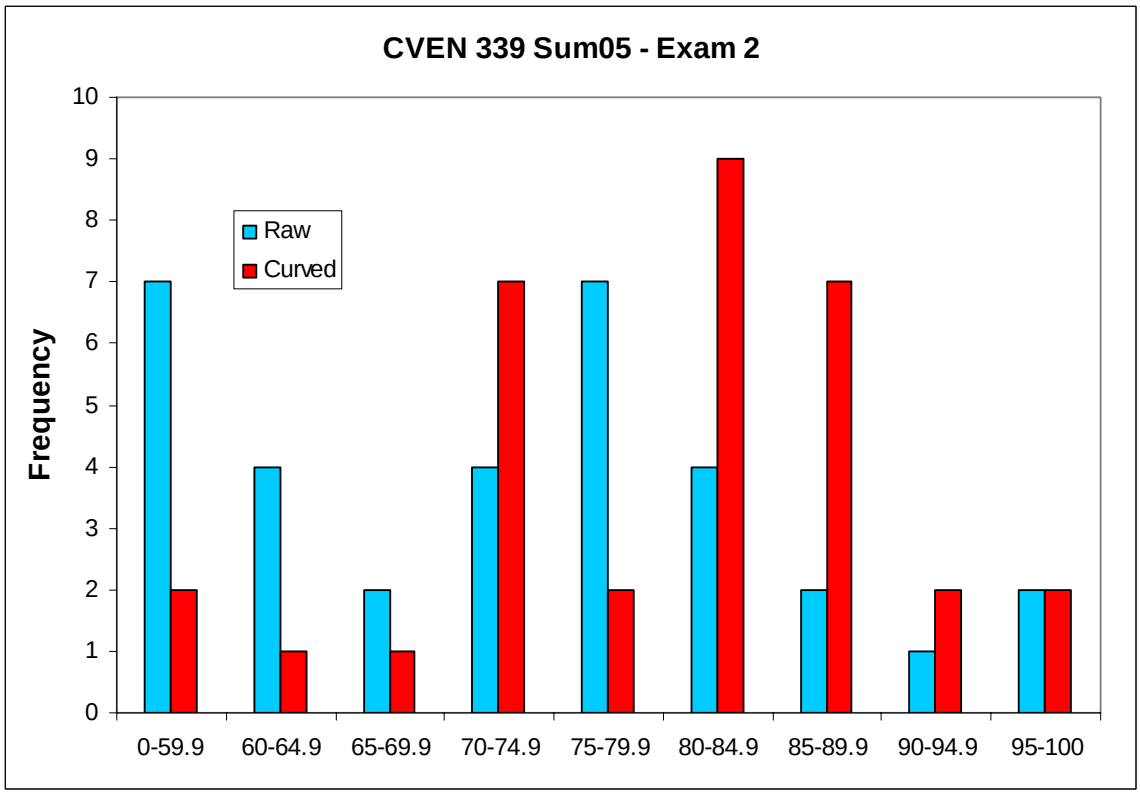
CVEN 339 – Summer 2005 – Exam #2

90 minutes allowed

	Raw	Curved
Median	72	80.8
Mean	70.9	80.0
Std. Dev.	14.3	10.0
High	98	99.0



Name: _____

CVEN 339 – Water Resources Engineering
Summer Semester 2005
Dr. Kelly Brumbelow, Texas A&M University

Exam #2

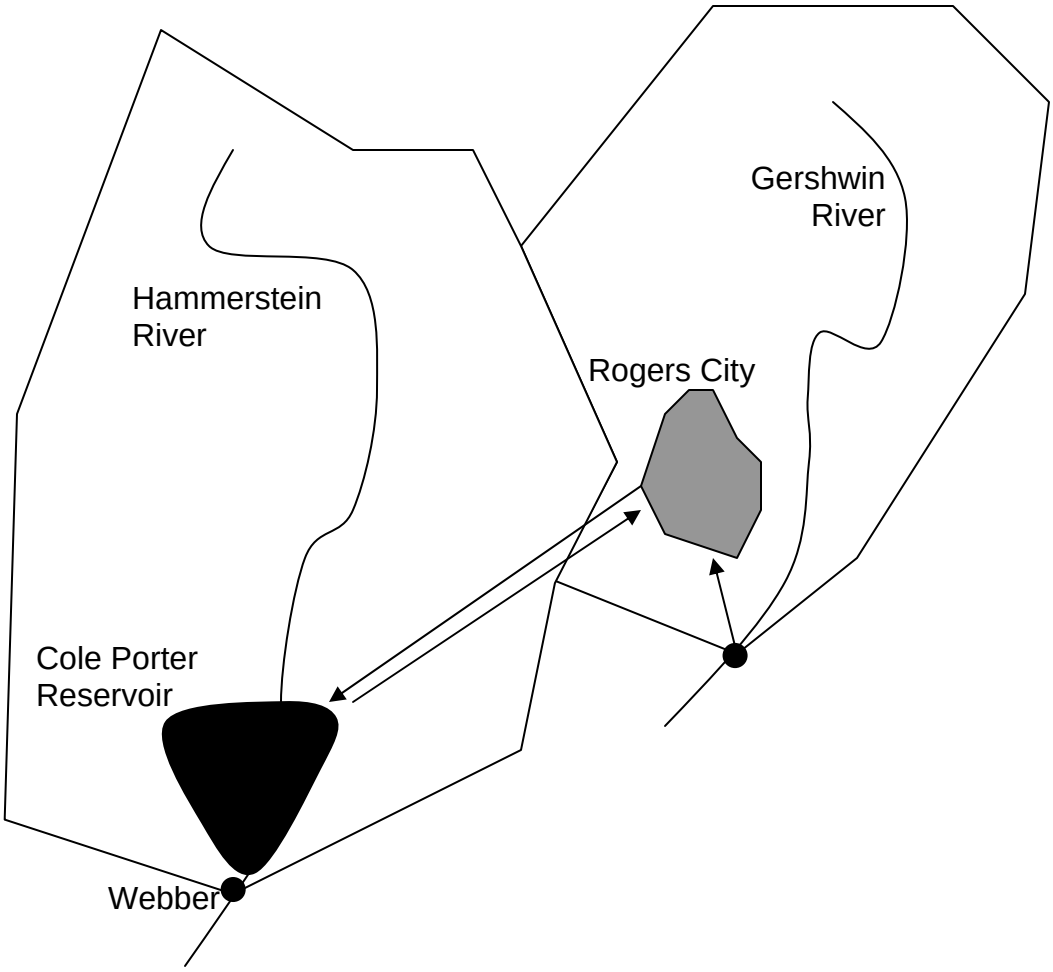
Open-book, Open-notes (7 pages, 2 questions); Time allowed: 90 mins.

1. In the past, Rogers City has taken all of its water supply from a single watershed (Gershwin River). However, that supply is now exhausted in drought years. To solve the problem of water shortages during droughts, a new reservoir (Cole Porter Reservoir) has been built at the outlet of an adjacent watershed (Hammerstein River). During wet years when streamflow in the Gershwin River exceeds the levels needed by the city, "excess" water will be sent by pipeline to the Cole Porter Reservoir. During drought years when the Gershwin River can not meet the city's needs, water will be pumped back to the city from the Cole Porter Reservoir. (See the map on the next page).

A lawsuit against Rogers City was recently filed by the City of Webber, which is downstream from Cole Porter Reservoir on the Hammerstein River. Webber's contention is that streamflows at Webber will be reduced under operation of the Cole Porter Reservoir (i.e., Rogers City will be getting extra water at the expense of Webber). To counter Webber's claims, Rogers City has produced a detailed hydrologic forecast and operations plan for the next 8 years, and it can be assumed that this forecast and plan is 100% correct(!). The forecast and plan are given below and on the next page. In the plan, net transfer of water to and from the Cole Porter Reservoir is zero, thus justifying Rogers City's claim to not be harming Webber.

Is the claim by Rogers City to not be affecting streamflows at Webber correct? If there is an impact on Webber's water supply, what will be the total change in streamflow volume over the 8 year plan? (50 points)

Year	Gershwin Precipitation (in)	Gershwin ET (in)	Hammerstein Precipitation (in)	Hammerstein ET (in)	Cole Porter Reservoir Evaporation (in)
2006	42.3	31.2	40.6	27.2	39.6
2007	48.1	30.4	44.3	20.1	42.3
2008	51.4	28.5	49.5	18.6	43.6
2009	41.3	33.6	42.1	25.4	41.2
2010	30.4	26.4	38.6	28.1	40.6
2011	28.1	25.2	35.4	29.3	43.1
2012	31.2	27.4	39.3	26.4	39.2
2013	42.2	31.3	40.5	23.4	40.3



Year	Rogers City Water Demand (ac-ft)	Water Transfer TO Cole Porter Reservoir (ac-ft)	Water Transfer FROM Cole Porter Reservoir (ac-ft)
2006	54,000	5,200	--
2007	50,000	44,400	--
2008	48,000	74,133	--
2009	54,000	--	12,933
2010	54,000	--	32,667
2011	60,000	--	44,533
2012	58,000	--	37,733
2013	54,000	4,133	--

Area of the Gershwin River watershed is 100 mi^2. Area of the Hammerstein River watershed (not including Cole Porter Reservoir) is 75 mi^2. Area of Cole Porter Reservoir is 10 mi^2 (invariant with depth). No groundwater interactions are present.

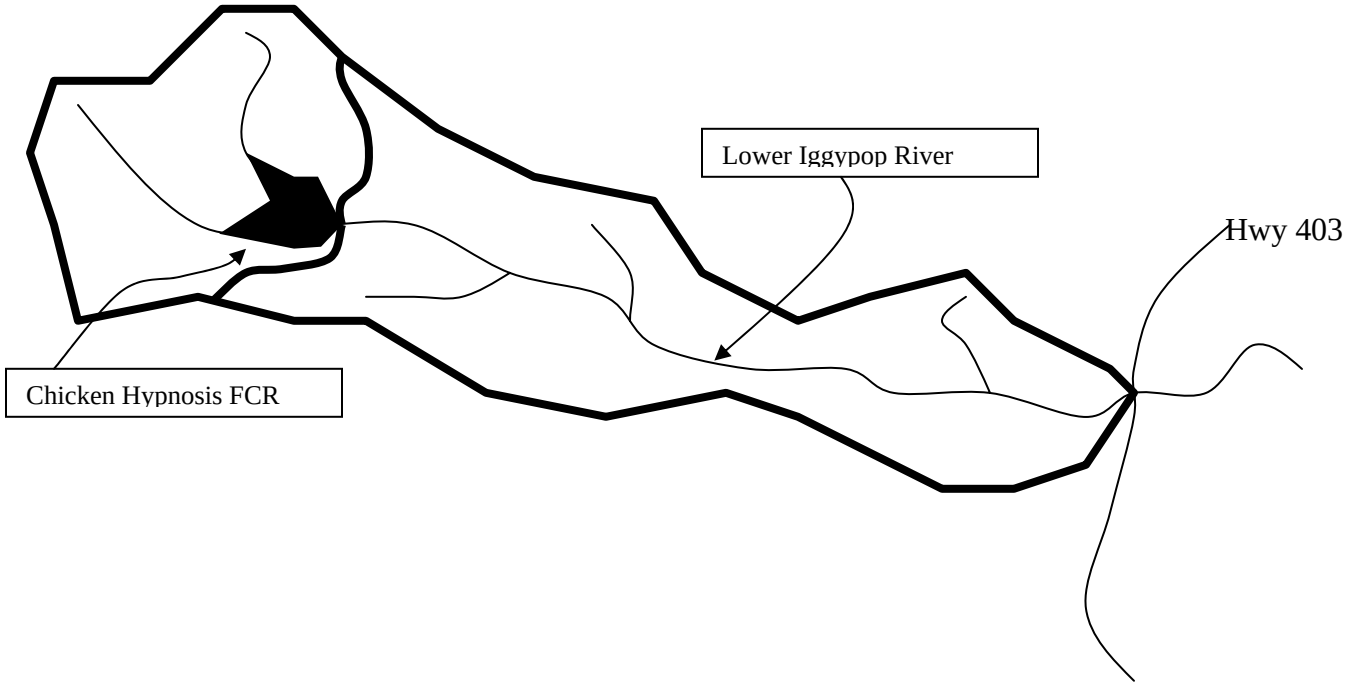
2. A storm occurs on the Iggypop River watershed upstream of the Chicken Hypnosis Flodd Control Reservoir (CHFCR). No rain falls on the Iggypop River watershed downstream of the CHFCR. Given the information below, predict the peak streamflow that will reach the Iggypop River at the Highway 403 bridge. (50 points)

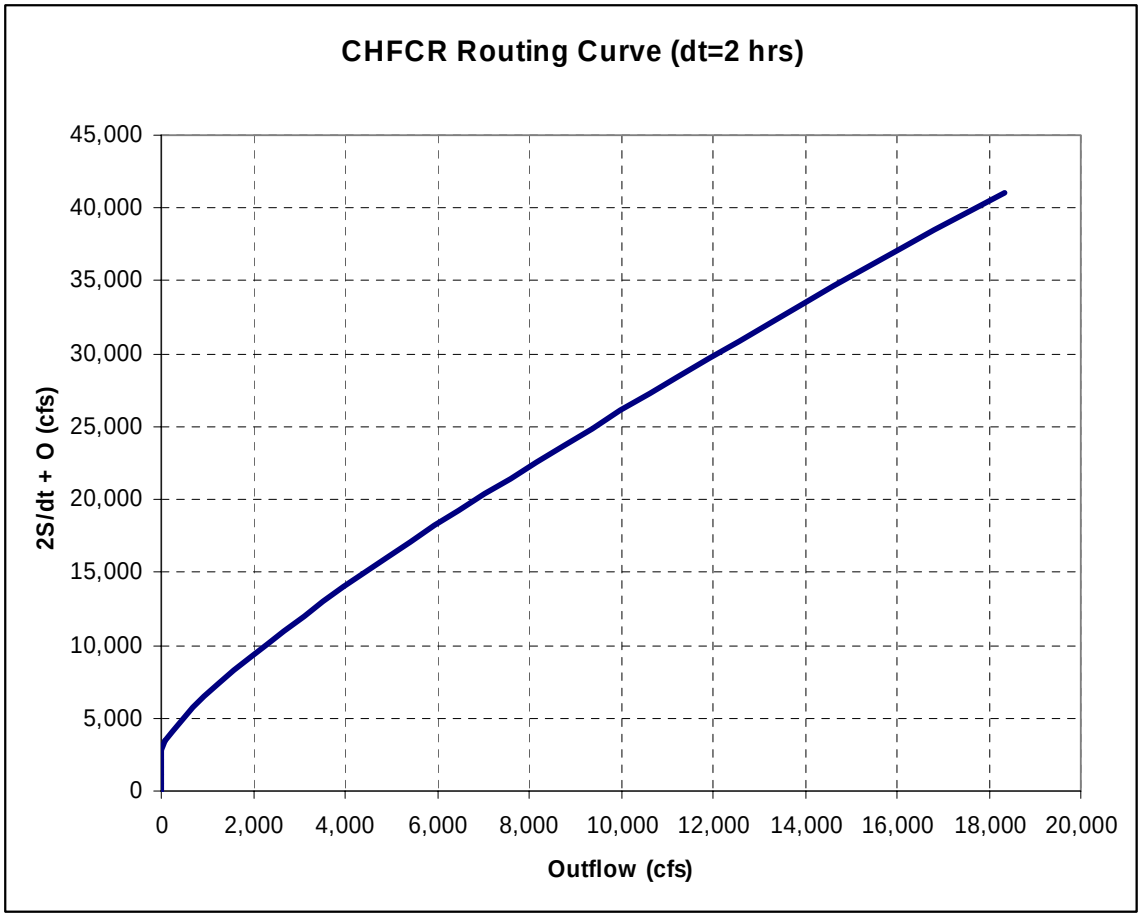
Storm: 8.53 in precipitation in 90 minutes

Upper Iggypop River Watershed: Area 20.2 mi^2, Hydraulic length 8.9 miles, Average land slope 3.2%; Soil is Hydrologic Soil Group B, Land cover is Pasture in Fair condition; Soil is saturated at beginning of the storm; Base flow is 20 cfs

Chicken Hypnosis FCR: Routing curve given on the next page. You may assume that initial outflow is equal to base flow.

Lower Iggypop River: K = 8 hours, X = 0.42




CHFCR Routing Curve (dt=2 hrs)
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
2S/dt + O (cfs)
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
Outflow (cfs)