Final Exam
Continuing Education Course #299
Floodplain Engineering
Modeling Flood Profiles Using HEC-RAS - Part 1

1. To establish the flood profile of a stream it is necessary to balance the energy at each cross section using what equation?
- a. The Momentum Equation.
- b. The Energy Equation.
- c. The Mass Equation.
- d. None of the above.

2. How should the cross sections be oriented in the HEC-RAS input?
- a. They should be drawn perpendicular to the flow direction.
- b. They should be drawn parallel to the flow direction.
- c. The orientation of the cross sections does not matter.

3. At all cross sections the reach length of the channel is equal to the reach lengths of the overbanks
- a. True.
- b. False.

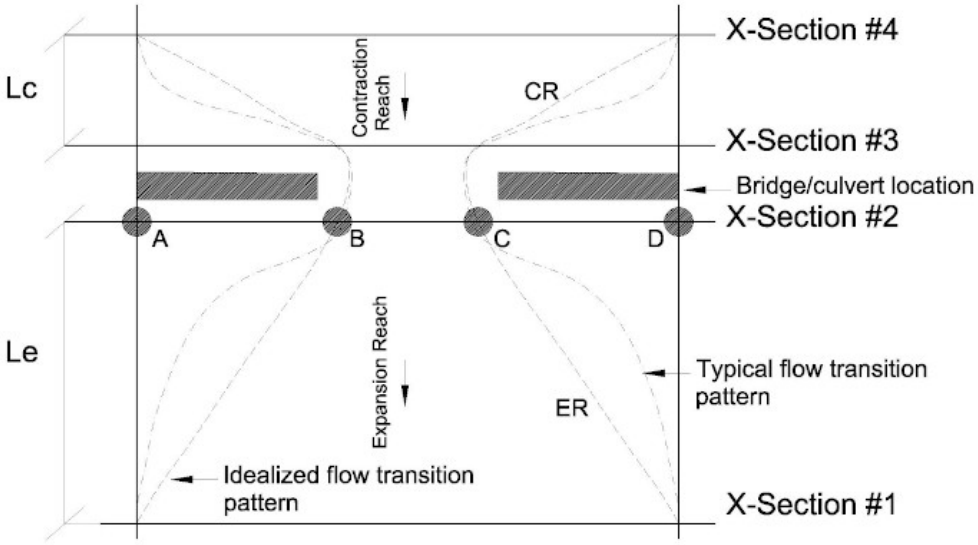
4. Which features can cause major backwater effects far upstream?
- a. Stream channels and overbank areas.
- b. Bridges.
- c. Culverts
- d. Both bridges & culverts.

5. Pressure flow computations take place at a bridge if the water surface does not reach the low chord of the bridge decking.
- a. True.
- b. False.

6. What is the weir flow over a 50 long bridge deck that is submerged by 18 inches.
- a. 23 CFS.
- b. 123 CFS.
- c. 239 CFS.
- d. 439 CFS.

7. What flow regime is described by a Froude Number of 2.35?
- a. Subcritical flow.
- b. Supercritical Flow.
- c. Critical Flow.

8. When modeling a bridge where should cross-section #1 be located? (Refer to the figure below):



Bridge & Culvert Cross Section Locations

- a. Far enough downstream of the structure that the flow is no longer affected by the bridge.
- b. 100 feet downstream of the bridge.
- c. 200 feet downstream of the bridge.
- d. The location of this cross section is not important in modeling the bridge.

9. When inputting the bridge parameters, what does the term width refer to?

- a. The width of the channel just upstream of the bridge.
- b. The width of the bridge deck perpendicular to the stream channel.
- c. The width if the bridge deck parallel to the stream channel.

10. When modeling a bridge, why is the “ineffective flow area” option used?

- a. This takes the area below the bottom of the stream bed out of the calculations.
- b. This takes ineffective area within the bridge decking out of the calculations.
- c. This takes ineffective areas along the roadway embankment that are not really effective in carrying floodwater out of the calculations.

11. If the bridge piers are a small obstruction to the flow, what computation method will yield the most realistic answer for low flow conditions?

- a. The Yarnell Equation.
- b. The standard step method.
- c. The WSPRO low flow option.

12. If the flow passes through critical depth within the vicinity of the bridge, then the WSPRO low flow method should be utilized.

- a. True.
- b. False.

13. The Yarnell Equation is suitable for both subcritical and supercritical flow?

○ a. True.
○ b. False.

14. When does “inlet control” occur in culvert hydraulics?
○ a. When the inlet is submerged.
○ b. When the inlet is not submerged.
○ c. When the flow capacity of the culvert barrel is greater than the flow capacity of the culvert entrance.
○ d. When the culvert capacity is limited by the flow capacity of the culvert barrel.

15. What are the appropriate Federal Highway Administration Chart # and Scale # for the concrete box culvert pictured below? The wingwalls are flared 15 degrees.

○ a. Chart 2, Scale 1.
○ b. Chart 8, Scale 1.
○ c. Chart 8, Scale 2.
○ d. Chart 11, Scale 1.

16. What would be the entrance loss coefficient of the culvert pictured in question #15, above?
○ a. 0.2.
○ b. 0.5.
○ c. 0.7.
○ d. 0.9.

17. What is the formula to determine the energy loss as the water exits the culvert?

○ a. Entrance loss coefficient times the change in velocity head from inside culvert to outside the culvert on the downstream end.
○ b. Exit loss coefficient times the change in velocity head from inside culvert to outside the culvert on the downstream end.

18. The “depth blocked” feature in the culvert program models what real-life situation?
○ a. The depth that the entrance to the culvert is blocked.
○ b. The depth that the exit of the culvert is blocked.
○ c. The depth that the entire culvert barrel is blocked.

19. HEC-RAS has the capability of modeling what kinds of unusual bridge situations?
○ a. Perched Bridges.
○ b. Low Water Bridges.
○ c. Bridges on a Skew.
○ d. Parallel Bridges.
○ e. Multiple Bridge Opening. (This includes openings of different sizes and shapes).
○ f. All of the above.

20. If the flow in a river is subcritical, the calculations proceed from downstream to upstream cross sections.
○ a. True.
○ b. False.

21. What is the hydraulic radius of a channel?
○ a. It is equal to the area.
○ b. It is equal to wetted perimeter.
○ c. It is the cross sectional area divided by the wetted perimeter.
○ d. It is the wetted perimeter divided by the cross sectional area.

22. What is the flow in a channel that has a flow area of 10 SF, a wetted perimeter of 10 feet, a Manning’s roughness coefficient of 0.035, and a slope of 0.01 feet per foot.
○ a. 4.2 CFS.
○ b. 24 CFS.
○ c. 42 CFS.
○ d. 420 CFS.

23. Which friction slope methods are available in HEC-RAS?
○ a. Average conveyance.
○ b. Average friction slope.
○ c. Geometric mean friction slope.
○ d. Harmonic mean friction slope.
○ e. All of the above.

24. The “multiple critical depth search” option is capable of calculating as many as three separate critical depths (minimum on the energy curve). Why, then, is it not always employed?
○ a. It is not very accurate.
○ b. It can affect the accuracy of the downstream flood profile.
○ c. It can slow down the profile generation.

25. There is always data against which to check the results of a HEC-RAS generated flood profile.
○ a. True.
○ b. False.