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Continuing Education Course #126
Open Channel Flow Measurement
Weirs and Flumes

1. Which of the following is NOT true for the drawdown of a sharp crested weir?
 - ☐ a. It begins upstream of the weir crest.
 - ☐ b. It is a lowering of the water level.
 - ☐ c. It is due to acceleration of the water.
 - ☐ d. It may be greater than the head over the weir, H.
2. A contracted, rectangular, sharp crested weir has its crest length equal to the approach channel width.
 - ☐ a. true
 - ☐ b. false
3. For a sharp crested weir, the velocity of approach is the flow rate over the weir divided by the cross-sectional area of water flowing directly over the weir.
 - ☐ a. true
 - ☐ b. false
4. Free flow over a sharp crested weir occurs for Which of the following conditions?
 - ☐ a. There is no drawdown above the weir crest.
 - ☐ b. $H \leq 2P$
 - ☐ c. There is free access of air under the nappe
 - ☐ d. The length of the weir crest is less than the width of the channel.
5. Which of the following is a condition that is NOT required in order to obtain accurate results from the equation, $Q = 2.49 H^{2.48}$, for a V notch weir.
 - ☐ a. The notch angle must be 90 degrees.
 - ☐ b. $P \geq 2 H_{\max}$
 - ☐ c. $S \geq 2 H_{\max}$
 - ☐ d. $H \geq 1.25 \text{ ft}$
6. Calculate the flow rate (in cfs) over a 90 degree, V notch weir with a head over the weir of $H = 0.7 \text{ ft}$. Assume that $P > 2H_{\max}$ and $S > 2H_{\max}$.
 - ☐ a. 0.046
 - ☐ b. 0.852
 - ☐ c. 1.03
 - ☐ d. 4.33
7. In order to use the equation, $Q = 3.33 B H^{3/2}$, for a suppressed rectangular weir, which of the following conditions must be met?

- ☐ a. $H/P \geq 0.33$
- ☐ b. $H/B \geq 0.33$
- ☐ c. $B/H \leq 0.33$
- ☐ d. $H/P \leq 0.33$

8. Calculate the flow rate (in cfs) passing over a suppressed rectangular weir in a 4 ft wide channel, with crest height, $P = 1.5$ ft, and head over the weir, $H = 0.3$ ft.

- ☐ a. 1.25
- ☐ b. 1.86
- ☐ c. 2.19
- ☐ d. 2.53

9. Which of the following requirement(s) must be met for a fully contracted, rectangular, sharp crested weir?

- ☐ a. $(B - L) \geq 4 H_{\max}$
- ☐ b. $H/L \geq 0.33$
- ☐ c. $P \leq H_{\max}$
- ☐ d. All of the above

NOTE: The following question was revised on 31 December 2018

10. Calculate the crest length correction factor, k_b (in ft), for a contracted rectangular weir with a crest length of 1 ft in a channel of width 4 ft.

- ☐ a. 0.003
- ☐ b. 0.0057
- ☐ c. 0.001
- ☐ d. 0.0082

11. Calculate the flow rate (in cfs) passing over a 2.5 ft long rectangular weir in a 6 ft wide channel, with crest height, $P = 2$ ft, and 0.8 ft as the head over the weir.

- ☐ a. 2.91
- ☐ b. 3.27
- ☐ c. 5.58
- ☐ d. 4.69

12. The top thickness of the crest and side plates of a sharp crested weir should be between _____ inch.

- ☐ a. 0.01 and 0.04
- ☐ b. 0.03 and 0.08
- ☐ c. 0.04 and 0.10
- ☐ d. 0.3 and 0.8

13. For proper installation of a sharp crested weir, the upstream face of the weir plates and bulkhead should be plumb, smooth, and perpendicular to the axis of the channel.

- ☐ a. true
- ☐ b. false

14. For proper installation of a sharp crested weir when the weir crest length is greater than 50% of the approach channel width, the following number of average approach flow widths of straight, unobstructed approach are required?

- ☐ a. 5
- ☐ b. 10
- ☐ c. 15
- ☐ d. 20

15. Which of the following is the minimum head over a sharp crested weir for accurate measurement of flow rate?
- ☐ a. 0.1 ft
 - ☐ b. 0.2 ft
 - ☐ c. 0.3 ft
 - ☐ d. 0.4 ft
16. A broad crested weir is more robust with regard to variations in upstream conditions than a sharp crested weir.
- ☐ a. true
 - ☐ b. false
17. In order to use the equation, $Q = C L H^{1.5}$, for flow over a broad crested weir, the flow over the weir crest must be critical flow.
- ☐ a. true
 - ☐ b. false
18. Calculate the flow rate (in cfs) in a 5 ft wide open channel in which the head over a broad crested weir, H , is measured to be 1.5 ft. Assume that the weir crest length is 5 ft, the weir is designed to provide critical flow over the weir crest, and the discharge coefficient is 3.1.
- ☐ a. 15.6
 - ☐ b. 33.8
 - ☐ c. 42.3
 - ☐ d. 28.5
19. What is the specified distance of the location for measurement of H_a upstream from the beginning of the throat section for a Parshall flume of throat width 15 ft?
- ☐ a. 3'-8"
 - ☐ b. 4'-4"
 - ☐ c. 5'-4"
 - ☐ d. 7'-8"
20. There will be a hydraulic jump visible in the flume throat for submerged flow through a Parshall flume.
- ☐ a. true
 - ☐ b. false
21. For a Parshall flume with a throat width of 8 inches, the maximum value of the ratio H_b/H_a for free flow is ____.
- ☐ a. 0.5
 - ☐ b. 0.6
 - ☐ c. 0.7
 - ☐ d. 0.8
22. What is the Parshall flume throat width for which the equation to calculate the flow rate for free flow conditions is $Q = 20H_a^{1.587}$ (for U.S. units)?
- ☐ a. 3 ft
 - ☐ b. 4 ft
 - ☐ c. 5 ft
 - ☐ d. 6 ft
23. What is the value of the constant 'M' in the equation for the submerged flow correction factor, Q_{corr} , for a Parshall flume with a throat width of 3 ft?
- ☐ a. 2.4
 - ☐ b. 3.1

- ☐ c. 3.7
- ☐ d. 4.3

24. The flow in the approach channel to a Parshall flume should be fully developed flow in a long straight channel with a mild slope, free of curves, projections, and waves.

- ☐ a. true
- ☐ b. false

25. How many throat widths of straight, unobstructed approach channel are needed for a Parshall flume with throat width less than half of the approach channel width?

- ☐ a. 5
- ☐ b. 10
- ☐ c. 20
- ☐ d. 30

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