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Continuing Education Course #162
Compound Channel Flow Analysis for Floodplains
An Introduction

1. A channel with varying frictional resistance in a cross-section is considered what type of channel?
 - ☐ a. Compound channel
 - ☐ b. Open channel
 - ☐ c. Composite channel
 - ☐ d. Closed channel
2. In an open channel, how is the hydraulic grade line (HGL) calculated?
 - ☐ a. By summing elevation head, water depth, and velocity head
 - ☐ b. By adding together elevation head and velocity head
 - ☐ c. By subtracting elevation head from water depth
 - ☐ d. By adding the elevation head and water depth
3. What is the wetted perimeter of an open channel with a trapezoidal cross-section, bottom width of 10 feet, flow depth of 4 feet, and 5:1 (horizontal:vertical) side slopes?
 - ☐ a. 40.79 ft
 - ☐ b. 50.79 ft
 - ☐ c. 91.58 ft
 - ☐ d. 218 ft
4. The hydraulic radius of an open channel with a triangular cross-section, flow depth of 6 meters, and 4:1 (horizontal:vertical) side slopes is?
 - ☐ a. 0.34 m
 - ☐ b. 0.74 m
 - ☐ c. 1.94 m
 - ☐ d. 2.91 m
5. What is the mean velocity in an open channel with a discharge of $120 \text{ ft}^3/\text{s}$ and a water cross-sectional area of 40 ft^2 ?
 - ☐ a. 0.33 ft/s
 - ☐ b. 1.5 ft/s
 - ☐ c. 3 ft/s
 - ☐ d. 3.33 ft/s
6. Which of the following formulas should not be used for open channel uniform flow?
 - ☐ a. Theis
 - ☐ b. Manning
 - ☐ c. Kutter
 - ☐ d. Hazen-Williams

7. Assuming uniform flow, what is the mean velocity for an open rectangular channel where n is 0.05, R is 4.09 ft^2 , and S is 0.005 ft/ft (please use the Manning formula)?

- ☐ a. 2.9 ft/s
- ☐ b. 3.6 ft/s
- ☐ c. 4.3 ft/s
- ☐ d. 5.4 ft/s

8. According to the course material the typical Manning's Roughness Coefficient for an excavated straight earthen channel with short grass and few weeds is?

- ☐ a. 0.027
- ☐ b. 0.030
- ☐ c. 0.040
- ☐ d. 0.050

9. What is the estimated Manning's Roughness Coefficient for a flood plain with a base n value of 0.028, n_1 equal to 0.001, n_2 equal to 0, n_3 equal to 0.005, n_4 equal to 0.002, and m equal to 1.15?

- ☐ a. 0.032
- ☐ b. 0.038
- ☐ c. 0.041
- ☐ d. 0.047

10. What is the conveyance, K , for an open channel where n is 0.04, A is 30 m^2 , and R is 1.30 m ?

- ☐ a. 893
- ☐ b. 975
- ☐ c. 1,331
- ☐ d. 1,453

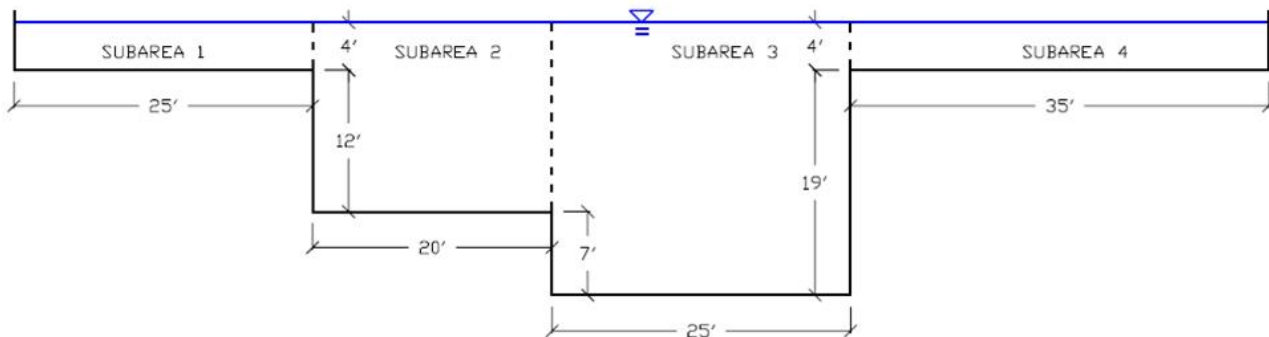
11. For the previous question what is the discharge of the channel if the friction slope is 0.008 m/m ?

- ☐ a. $80 \text{ m}^3/\text{s}$
- ☐ b. $87 \text{ m}^3/\text{s}$
- ☐ c. $119 \text{ m}^3/\text{s}$
- ☐ d. $130 \text{ m}^3/\text{s}$

12. According to the recommendations given in the course material an open channel with an overbank width of 14 ft, overbank depth of 3 ft, main channel width of 10 ft, and main channel depth of 8 ft should be subdivided.

- ☐ a. True
- ☐ b. False

13. For the figure shown, what is the wetted perimeter of subarea 3?

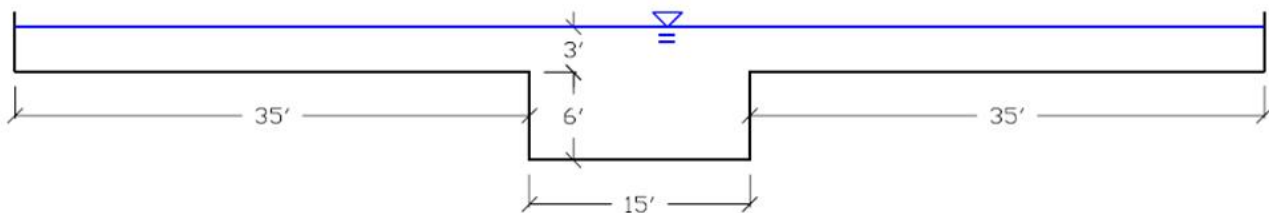


- ☐ a. 51 ft
- ☐ b. 55 ft
- ☐ c. 71 ft
- ☐ d. 96 ft

14. According to the course material, what subdivision method has a number of studies found to result in the smallest discharge error?

- ☐ a. Vertical
- ☐ b. Diagonal
- ☐ c. Horizontal
- ☐ d. Bisection

15. Using the Pavlovskii method (and vertical subdivision lines), the figure provided, a bed slope of 0.003 ft/ft, main channel water depth of 9 ft, a main channel n of 0.04, and floodplains n values of 0.07, what is the Composite Manning's Roughness Coefficient?



- ☐ a. 0.006
- ☐ b. 0.050
- ☐ c. 0.062
- ☐ d. 0.064

16. Given the same information in question 15, what is the Composite Manning's Roughness Coefficient if the Lotter method is used instead?

- ☐ a. 0.043
- ☐ b. 0.047
- ☐ c. 0.049
- ☐ d. 0.051

17. Given the same information in question 15, what is the Composite Manning's Roughness Coefficient if the Horton method is used instead?

- ☐ a. 0.049
- ☐ b. 0.063
- ☐ c. 0.066
- ☐ d. 0.069

18. Given the same information in question 15, what is the Composite Manning's Roughness Coefficient if the Colebatch method is used instead?

- ☐ a. 0.048
- ☐ b. 0.053
- ☐ c. 0.059
- ☐ d. 0.063

19. Given the same information in question 15, what is the Composite Manning's Roughness Coefficient if the Krishnamurthy and Christensen method is used instead?

- ☐ a. 0.039
- ☐ b. 0.042
- ☐ c. 0.045
- ☐ d. 0.049

20. Given the same information in question 15, what is the Composite Manning's Roughness Coefficient if the Cox method is used instead?

- ☐ a. 0.058
- ☐ b. 0.061
- ☐ c. 0.063
- ☐ d. 0.066

21. Given the same information in question 15, what is the Composite Manning's Roughness Coefficient if the Yen method presented in the course is used instead?

- ☐ a. 0.044
- ☐ b. 0.048
- ☐ c. 0.063
- ☐ d. 0.066

22. What is the 2nd largest discharge calculated when the n_c values determined in questions 15 to 21 are used?

- ☐ a. 1,183 ft³/s
- ☐ b. 1,212 ft³/s
- ☐ c. 1,287 ft³/s
- ☐ d. 1,334 ft³/s

23. Given the same information in question 15, what is the discharge if the segmented conveyance method is used instead?

- ☐ a. 1,230 ft³/s
- ☐ b. 1,287 ft³/s
- ☐ c. 1,313 ft³/s
- ☐ d. 1,389 ft³/s

24. For a given composite compound open channel the discharges calculated using the Lotter method and segmented conveyance method are always the same.

- ☐ a. True
- ☐ b. False

25. HEC-RAS uses the _____ method for determining a main channel composite n value and the _____ method for calculating the total discharge of a compound channel.

- ☐ a. Lotter, segmented conveyance
- ☐ b. Lotter, Cox
- ☐ c. Horton, segmented conveyance
- ☐ d. Horton, Cox

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