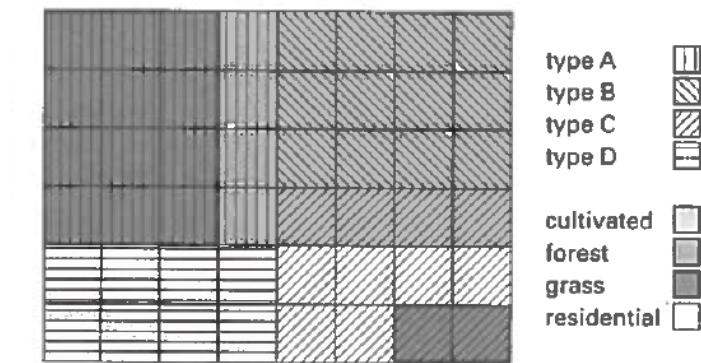


# **Hydraulics and Hydrologic Systems FE Training Quiz**

- Each square in the watershed shown in Figure 1 is 1 acre in size.



| land use    | curve numbers |        |        |        |
|-------------|---------------|--------|--------|--------|
|             | soil type     |        |        |        |
|             | type A        | type B | type C | type D |
| residential | 57            | 72     | 81     | 66     |
| grass       | 30            | 58     | 71     | 78     |
| forest      | 25            | 55     | 70     | 77     |
| cultivated  | 62            | 71     | 78     | 81     |

Figure 1: Hypothetical Watershed (48 acres) with Different Land Cover Conditions

Using the tabulated curve numbers for the land uses based on soil type, what is the weighted curve number for the entire 48 acre watershed?

- 49
- 56
- 61
- 68

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2. The flow rate in a rectangular channel 4 meters wide is  $20 \text{ m}^3/\text{second}$ . The **critical** depth is

- (A) 1.0 meters
- (B) 1.4 meters
- (C) 2.0 meters
- (D) 2.7 meters

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3. A residential lot of 0.37 acres contains a house that occupies 0.05 acres, and a driveway that covers 0.035 acres. The runoff coefficients are 0.50 for the undeveloped portions of the lot, 0.85 for the house, and 0.90 for the driveway. The peak discharge from the lot during a storm event with rainfall intensity of 0.5 inches per hour is

- (A)  $0.085 \text{ ft}^3/\text{sec}$
- (B)  $0.110 \text{ ft}^3/\text{sec}$
- (C)  $0.250 \text{ ft}^3/\text{sec}$
- (D)  $0.320 \text{ ft}^3/\text{sec}$

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4. A 25 acre drainage basin has a curve number of 81. The basin receives 4.5 inches of rainfall in a 24 hour interval. The total runoff, in watershed inches is

- (A) 0.33 inches
- (B) 0.81 inches
- (C) 2.60 inches
- (D) 4.80 inches

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5. A 6 meter wide, rectangular channel carries  $24 \text{ m}^3/\text{second}$  at **critical** depth. The velocity is

- (A)  $1.1 \text{ m/s}$
- (B)  $3.4 \text{ m/s}$
- (C)  $6.3 \text{ m/s}$
- (D)  $14 \text{ m/s}$

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6. A 3.5 acre drainage area receives a rainfall intensity of 0.5 in/hour; the peak runoff from the area is 500 gallons per minute. What is the runoff coefficient?

- (A) 0.11
- (B) 0.31
- (C) 0.64
- (D) 0.86

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7. A rectangular concrete channel has a depth of 3 meters, a width of 5 meters, and a slope of 0.004. The Manning's roughness coefficient for the channel is 0.013. When full, the velocity of water in the channel is

- (A) 1.0 m/sec
- (B) 6.0 m/sec
- (C) 15 m/sec
- (D) 90 m/sec

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8. A drainage basin with a curve number of 72 receives 5 inches of rain during a two-day storm. The runoff from the basin in watershed inches is

- (A) 0.52 inches
- (B) 0.62 inches
- (C) 2.20 inches
- (D) 4.10 inches



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9. Figure 2 depicts a concrete dam that impounds water as shown. The standing water depth is 1.5 meters. The soil layer under the reservoir is underlain by a highly porous sand layer. The sand layer at the bottom of the soil profile has horizontal

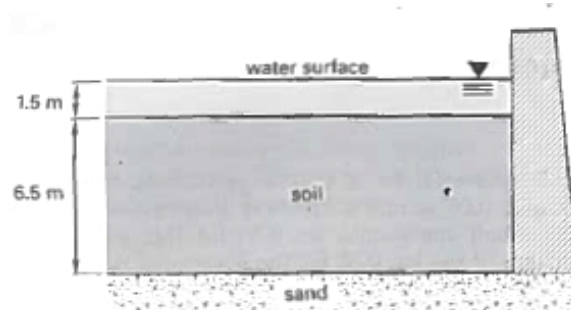


Figure 2: Debris trap (dam) with 6.5 meters of sediment above a sand layer

drainage and zero pore pressure. The water level of the reservoir is constant. The total surface area of the reservoir pool is  $1000 \text{ m}^2$ , and the hydraulic conductivity of the soil layer is  $4.7 \times 10^{-6} \text{ mm/sec}$ . The loss from seepage through the soil layer per year is

- (A) 1.1 cubic meters
- (B) 2.8 cubic meters
- (C) 34 cubic meters
- (D) 180 cubic meters

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10. An unconfined aquifer is 300 feet deep, and has a hydraulic conductivity of 0.5 feet per day. A one-foot diameter well is drilled into the aquifer and pumped at a rate of 50 gallons per minute. The well's radius of influence is 1000 feet. After pumping has continued long enough for equilibrium to be established, the depth of water in the well is

- (A) 190 feet
- (B) 220 feet
- (C) 240 feet
- (D) 270 feet