



These problems address topics from the NCEES FE Civil CBT Exam Specifications at <https://ncees.org/wp-content/uploads/FE-Civil-CBT-specs-1.pdf>, see below.

## **FE Civil Review 2022**

### **Fluid Mechanics**

*NCEES Fundamentals of Engineering (FE)*

*CIVIL CBT Exam Specifications*

*Effective Beginning with the July 2020 Examinations*



**YouTube Playlist**

Knowledge

Number of Questions

#### **8. Fluid Mechanics**

**6–9**

- A. Flow measurement
- B. Fluid properties
- C. Fluid statics
- D. Energy, impulse, and momentum of fluids

#### Notes

V1.0 published 3/7/2022

V1.1 updates/corrections to questions 3/8/2022

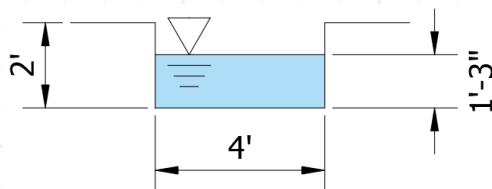
V1.2 title sheet 3/29/2022

V1.3 correction 5/10/2022



## A. Flow Measurement

**Question 1:** A small channel with measurements indicated below is used to convey water. The mid-depth velocity is found directly using measurements and is approximately 1.5 ft/sec. Assuming a correction factor of 0.9 is appropriate to account for the roughness of the channel and edge effects, the flow in the channel is most nearly:



A. 3.5 cfs

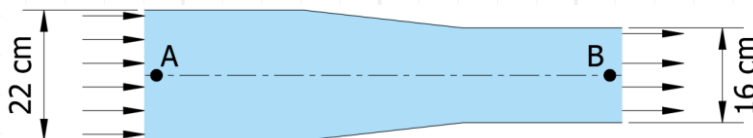
B. 6.8 cfs

C. 7.5 cfs

D. 8.2 cfs

## A. Flow Measurement

**Question 2:** An incompressible fluid is flowing through a system of pipes with a contraction and diameters as shown below. If it is known that the velocity at point A is 2 m/s, then the velocity at point B is most nearly:



A. 1.5 m/s

B. 2.0 m/s

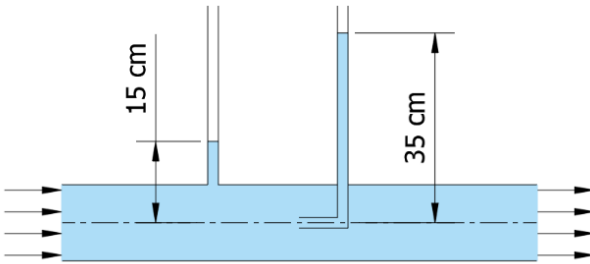
C. 2.8 m/s

D. 3.8 m/s



**A. Flow Measurement**

**Question 3:** A pitot tube is used in a pipe with an internal diameter of 20 cm to obtain an approximation of the measure of flow of water through the pipe. Assume friction losses are minimal. Given pitot tube heights as indicated in the figure below, the flow in the pipe is most nearly:

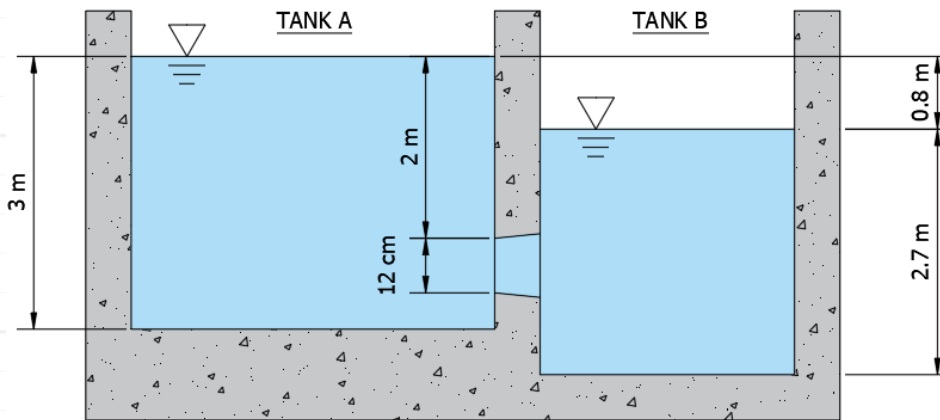


- A.  $0.002 \text{ m}^3/\text{s}$
- B.  $0.020 \text{ m}^3/\text{s}$
- C.  $0.062 \text{ m}^3/\text{s}$
- D.  $0.10 \text{ m}^3/\text{s}$



## A. Flow Measurement

**Question 4:** A sharp-notched submerged orifice is used to transfer water from one open tank to another in a steady state as indicated. The orifice is rectangular with height of 12 cm, width of 20-cm into the page (not shown). Based on the conditions indicated, the flow of water between the two tanks (in liters per second) is most nearly:



- A. 60 lps
- B. 70 lps
- C. 80 lps
- D. 90 lps

## B. Fluid Properties

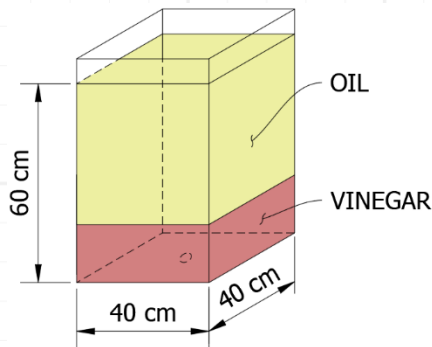
**Question 5:** A raft made from 8x8 timbers (actual dimensions of 7.5-inches x 7.5-inches) is 6-ft wide by 8-ft long. It is made from wood that has a unit weight of 45 pcf when wet. The maximum cargo that the raft can carry without submerging the raft is most nearly:

- A. 500 lbs
- B. 600 lbs
- C. 700 lbs
- D. 800 lbs



## B. Fluid Properties

**Question 6:** A bulk vat of vinaigrette salad dressing contains a mix of oil to vinegar in a ratio of 3:1. The oil has a density of 0.9 g/mL and the vinegar has a density of 0.96 g/mL. A 2-cm diameter plug is used to close a drain at the bottom of the vat. The force on the plug based on the fluids is most nearly:



A. 1.7 N

B. 1.8 N

C. 1.9 N

D. 2.0 N

## B. Fluid Properties

**Question 7:** A bulk tub of vinaigrette salad dressing contains a mix of oil to vinegar in a ratio of 3:1. The oil has a density of 0.9 g/mL and the vinegar has a density of 0.96 g/mL. See figure above. The total force on one sidewall of the vat due to the fluids is most nearly:

A. 16 N

B. 640 N

C. 680 N

D. 1590 N



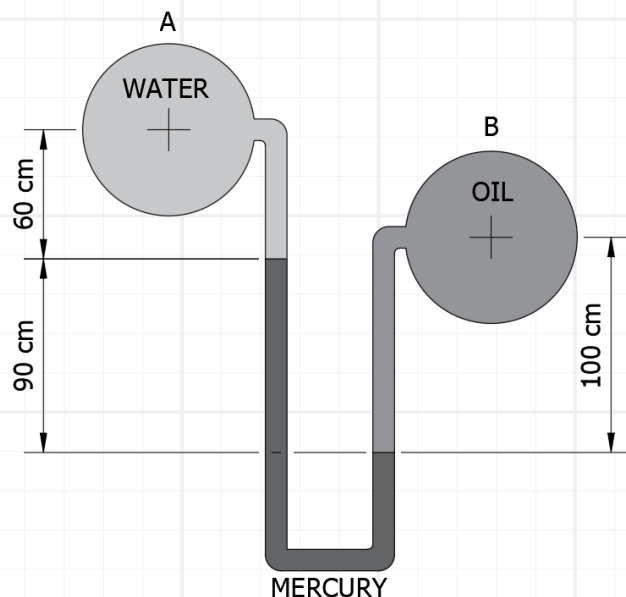
## B. Fluid Properties

**Question 8:** A barometer is filled with mercury, which has a specific gravity of 13.6. If the column of mercury is 725 mm at a certain elevation, the atmospheric pressure at this elevation is most nearly:

- A. 96.7 kPa
- B. 98.1 kPa
- C. 100.1 kPa
- D. 101.3 kPa

## B. Fluid Properties

**Question 9:** A manometer is used to measure the pressure difference between the two pipes shown. Pipe A contains water and is set at a gauge pressure of 100 kPa. The water is separated from Pipe B that contains oil with a specific gravity of 0.8 by a U-tube manometer filled with mercury that has a specific gravity of 13.6. If the pressure in Pipe A is gauged at 100 kPa, the pressure in Pipe B is most nearly:

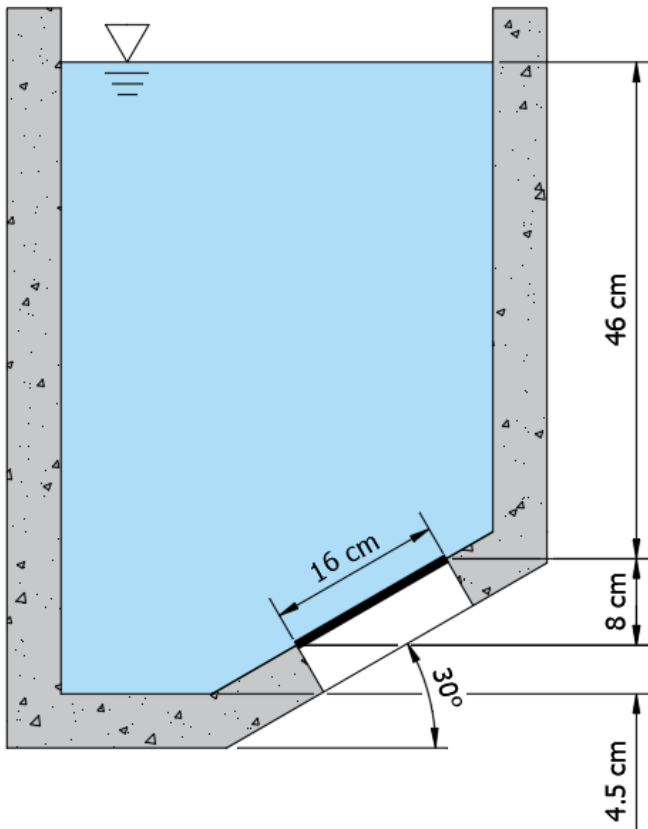


- A. 81.9 kPa
- B. 101.2 kPa
- C. 208.8 kPa
- D. 218.1 kPa



**C. Fluid Statics**

**Question 10:** A submerged square gate with the dimensions indicated is placed in a tank of water that is open to the atmosphere. The depth to the centroid of pressure on the gate surface is most nearly:

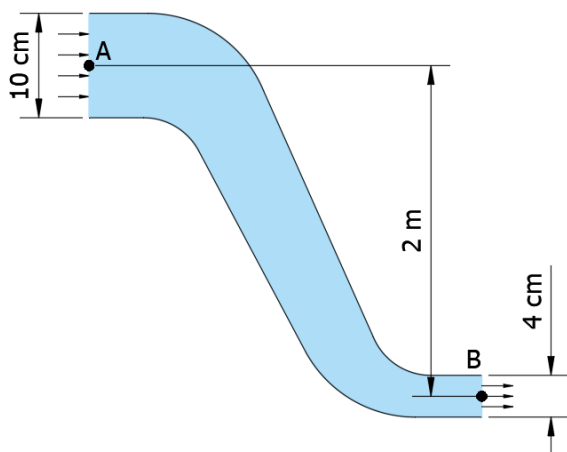


- A. 50.00 cm
- B. 50.05 cm
- C. 50.11 cm
- D. 50.18 cm



## D. Energy, impulse and momentum of fluids

**Question 11:** A water jet is used to gradually reduce the diameter of a pipe and increase the water velocity at the discharge point. Assume the water has a gage pressure of 100 kPa at the point A and discharges at atmospheric pressure (assume 101.3 kPa) at point B. There is a 2-meter drop from the entrance to the exit. Assume the water is incompressible and ignore losses in the pipe. The velocity at point B is most nearly.



A. 6 m/s

B. 16 m/s

C. 21 m/s

D. 42 m/s





**ONWARD  
UPWARD**

MARK MATTSON, PE

Name: MM

Course: CTC485 Assignment: FE Review

Description: Fluid Mechanics (v1.3)

Date: 3/7/2022 Page: 9 of 9

**D. Energy, impulse and momentum of fluids**

**Question 12:** A 12-inch diameter pipe will be installed with a 30° elbow as a water line in a horizontal configuration for service at 50 pounds per square inch. The total horizontal thrust force the water exerts at this elbow is most nearly:

A. 2,930 lbs

B. 4,330 lbs

C. 5,650 lbs

D. 8,000 lbs