

# CBCS SCHEME

17MT42

Fourth Semester B.E. Degree Examination, June/July 2019

## Fluid Mechanics and Machines

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Define the following :  
i) viscosity ii) surface tension iii) vapour pressure iv) cavitation. (08 Marks)
- b. A differential manometer is connected at the two points A and B of two pipes as shown in below Fig.Q1(b). The pipe A contains a liquid of specific gravity 1.5 while pipe b contains a liquid of specific gravity 0.9. The pressure at A and B are  $1\text{kgf/cm}^2$  and  $1.80\text{kgf/cm}^2$  respectively. Find the difference in mercury level in the differential manometer. (12 Marks)

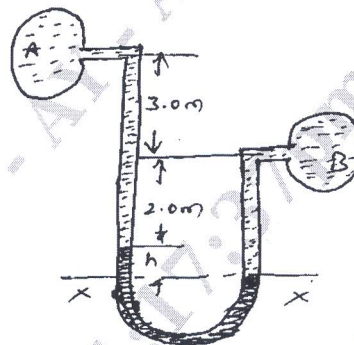


Fig.Q1(b)

OR

- 2 a. Derive an expression to find the total pressure and centre of pressure of vertical plane surface submerged in liquid. (10 Marks)
- b. Define gauge pressure, atmospheric pressure and vacuum pressure. (03 Marks)
- c. Determine the total pressure on a circular plate of diameter 1.5m which is placed vertically in water in such a way that the centre of the plate is 3m below the free surface of water. Find the position of center of pressure also. (07 Marks)

### Module-2

- 3 a. Briefly explain types of fluid flow. (07 Marks)
- b. Derive Euler's equation of motion. (10 Marks)
- c. List the limitations of Bernoulli's equation. (03 Marks)

OR

- 4 a. Define the equation of continuity. Obtain an expression for continuity equation for a three-dimensional steady incompressible flow. (12 Marks)
- b. A non-uniform part of a pipe line 5m long is laid at a slope of 2 in 5. Two pressure gauges each fitted at upper and lower ends read  $20\text{N/cm}^2$  and  $12.5\text{N/cm}^2$ . If the diameters at the upper and lower ends are 15cm and 10cm respectively, determine the quantity of water flowing per second. (08 Marks)

**Module-3**

- 5 a. What are the methods of dimensional analysis? Describe the Rayleigh's method for dimensional analysis. (05 Marks)  
b. State Buckingham's P-theorem. Why this theorem is considered superior over the Rayleigh's method for dimensional analysis. (05 Marks)  
c. Derive an expression for find the discharge of fluid through a venturimeter. (10 Marks)

**OR**

- 6 a. What do you mean by similitude. Explain type of similitudes in detail. (10 Marks)  
b. Derive an expression to find the discharge of fluid flowing through orifice meter. (10 Marks)

**Module-4**

- 7 a. Define turbomation with neat figure and list the parts of turbomachine. (05 Marks)  
b. Compares turbomachine with positive displacement machines. (05 Marks)  
Derive Euler turbine equation and explain alternate form of Euler turbine equation. (10 Marks)

**OR**

- 8 a. Write note on :  
i) General analysis of turbo machine  
ii) Effect of blade discharge angle on energy transfer. (10 Marks)  
b. Classify turbomachine and give example for each class. (10 Marks)

**Module-5**

- 9 a. Derive maximum efficiency of Pelton turbine (10 Marks)  
b. List the types of draft tubes and explain its functions. (10 Marks)

**OR**

- 10 a. Explain any two methods of compounding. (10 Marks)  
b. Derive maximum efficiency of Kaplan turbine. (10 Marks)

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