



SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code : FM(15A01305)

Course & Branch: B.Tech - CE

Year & Sem: II-B.Tech & I-Sem

Regulation: R15

UNIT – III

Dynamics of Fluid Flow and Flow Measurements in Pipes

1. a) What is Euler's equation of motion? How do you obtain Bernoulli's equation from it?
Name the different forces present in a fluid flow 5M
- b) State Bernoulli's theorem for steady flow of an incompressible fluid. Derive the expression for Bernoulli's theorem from first principle and state the assumption made for such a derivation. 5M
2. a) Water is flowing through a pipe of 5 cm diameter under a pressure of 29.43 N/cm^3 (gauge) and with mean velocity of 2.0 m/s. Find the total head or total energy per unit weight of the water at a cross section which is 5 m above the datum line. 5M
- b) Water is flowing through a pipe has diameter 300 mm and 200 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm^2 and the pressure at the upper end is 9.81 N/cm^2 . Determine the difference in datum head if the rate of flow through pipe is 40 lit/s. 5M
3. A pipe line carrying oil of specific gravity 0.87, changes in diameter from 200 mm diameter at a position A to 500 mm diameter at a position B which is 4 m at a higher level. If the pressures at A and B are 9.81 N/cm^2 10M
4. a) A horizontal venturimeter with 30cm diameter inlet and 10cm throat is used for measuring the flow of water through a pipeline. If pressure in pipe is 1.5kpa and the vacuum pressure at the throat is 40cm of mercury, calculate the rate of flow. It may be presumed that 5% of differential head is lost between the pipe main and the throat section. Also make calculations for the discharge co-efficient take specific weight of water = 10 kN/m^3 5M
- b) In a 100mm diameter horizontal pipe a venturimeter of 0.5 contraction ratio has been fixed. The head of water on the meter when there is no flow is 3m (gauge). Find the rate of flow for which the throat pressure will be 2m of water is 0.97 take atmospheric pressure head = 10.3m of water. 5M

5. a) The following data relate to an orifice meter
- Diameter of the pipe = 240mm
 Diameter of the orifice = 120mm
 Specific gravity of oil = 0.88
 Reading of differential manometer = 400mm of mercury
 Co – efficient of discharge of the meter = 0.65
- Determine the rate of flow of oil. 5M
- b) An orifice meter with orifice diameter 10cm is inserted in a pipe of 20cm diameter. The pressure gauges fitted up stream and down stream of 19.62N/cm^2 and 9.81N/cm^2 respectively co-efficient of discharge for the meter is given as 0.6. Find the discharge of water through pipe. 5M
6. a) Explain pitot tube and pitot static tube. 5M
- b) A sub-marine moves horizontally on a sea and has its axis 15m below the surface of water. A pitot tube properly placed just in front of a sub-marine and along its axis is connected to two limbs of a u – tube containing mercury. The difference of mercury level is found to be 170mm find the speed of the sub-marine knowing that the specific gravity of mercury is 13.6 and that of sea water is 1.026 with respect of fresh water. 5M
7. Explain the principle of orifice meter and derive the equation to find the rate of flow of water through a pipe using the same. 10M
8. a) Explain pitot tube and pitot static tube. 5M
- b) A sub – marine moves horizontally in sea and as its axis 15 m below the surface of water. A pitot tube properly placed ject in front of the sub – marine and along its axis is connected to the two limbs of a U – tube containing mercury. The difference of mercury levels is found to be 170 mm. Find the speed of the sub – water is 1.026 with respect of fresh water. 5M
9. An external cylindrical mouth piece of diameter 150 mm is discharging water under a constant head of 6 m. Determine the discharge and absolute pressure head of water at vena – contracta. Take $C_d = 0.855$ and C_c for vena contracta = 0.62 and atmospheric pressure head = 10.3 of water. 10M
10. a) What is the difference between pitot tube and pitot-static tube. 2M
- b) Discuss the relative merits and demerits of venturimeter with respect to prifice meter. 2M
- c) What is Euler’s equation of motion ? How will you obtain Bernoulli’s equation from it? 2M
- d) Define the continuity equation and Bernoulli’s equation. 2M
- e) Define moment of momentum equation. Where this equation is used. 2M

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Dynamics of Fluid Flow and Flow Measurements in Pipes

- Ber noulli's equation is derived making assumption that []
 A) The flow is uniform and incompressible B) The flow is uniform and turbulent
 C) The flow is steady, ideal, incompressible and irrotational D) The flow is ideal, uniform
- The Ber noull's equation can take the form []
 A) $\frac{p}{\rho g} + \frac{v^2}{2g} + z = \text{Constant}$ B) $\frac{1}{\rho g} + \frac{v^2}{2g} + z = \text{Constant}$
 C) $\frac{p}{g} + \frac{v^2}{2g} + z = \text{Constant}$ D) $\frac{p}{\rho g} + \frac{v^2}{2g} - z = \text{Constant}$
- If the flow is assumed to be ideal, the viscous force is zero then the equation is []
 A) Reynold's equation B) Navier-Stokes equation C) Euler's equation D) Ber noulli's equation
- Venturi meter is a device used for measuring the rate of flow in []
 A) Channel B) Pipe C) Tube D) Tank
- Pitot tube is a device which is used to measure []
 A) Velocity of flow B) Rate of flow C) Density D) Efficiency
- The equation for calculating the actual discharge in pipe is []
 A) $Q_{\text{act}} = Q_{\text{th}}$ B) $Q_{\text{act}} = 2 * Q_{\text{th}}$ C) $Q_{\text{act}} + Q_{\text{th}} = 0$ D) $Q_{\text{act}} = C_d * Q_{\text{th}}$
- The coefficient of discharge for venturi meter is []
 A) More than one B) Less than one C) Equal to one D) Is constant
- The range for co-efficient of discharge (C_d) is []
 A) 0.6 to 0.7 B) 0.7 to 0.8 C) 0.8 to 0.9 D) 0.95 to 0.99

9. The net force acting on fluid mass is equal to the change in momentum of flow per unit time is []

- A) Law of conservation of momentum B) Law of conservation of mass
C) Law of conservation of energy D) Law of conservation of force

10. The resultant torque in momentum equation is []

- A) $T = \rho Q(v_2 r_2 + v_1 r_1)$ B) $T = Q(v_2 r_2 + v_1 r_1)$ C) $T = \rho Q(v_2 r_2 - v_1 r_1)$ D) $T = \rho(v_2 r_2 - v_1 r_1)$

11. The Euler's equation of motion can be integrated only when []

- A) the fluid is compressible B) continuity equation satisfied
C) the flow is steady and irrotational D) the flow is non-viscous and barotropic

12. Bernoulli's equation relates []

- A) various forces with change in momentum B) torque to change in angular momentum
C) various forms of energy D) various forces involved in fluid flow

13. In Bernoulli's equation stated in the form $p/w + v^2/2g + y = \text{constant}$ has units of []

- A) N B) M-N/kg C) M-N/N D) M-N/s

14. Navier Stoke's equation represents the conservation of []

- A) Energy B) Mass C) Pressure D) Momentum

15. In a venturimeter, the angle of the diverging section is more than that of converging section. []

- A) True B) False C) Insufficient data D) Can't say

16. Bernoulli's equation represents the []

A) Force at any point in flow field and is obtained by integrating the momentum equation for viscous flows.

B) Energies at any point in the flow field and is obtained by integrating the Euler equations.

C) Momentum at any point in the flow field and is obtained by integrating the equation of continuity.

D) Moment of momentum and is obtained by integrating the energy equation.

17. When is Bernoulli's equation applicable between any two points in a flow fields []

- A) The flow is steady, incompressible B) The flow is steady, compressible
- C) The flow is incompressible and irrotational D) The flow is steady, incompressible and irrotational
18. The expression $(p + \rho gz + \rho v^2/2)$ commonly used to express Bernoulli's equation, has units of []
- A) Total energy per unit mass B) Total energy per unit weight
- C) Total energy per unit volume D) Total energy per unit cross-sectional area of flow
19. Which one of the following statements is correct? While using boundary layer equations, Bernoulli's equation []
- A) Can be used anywhere B) Can be used only outside the boundary layer
- C) Can be used only inside the boundary layer D) Cannot be used either inside or outside of boundary
20. The Euler's equation of motion is a statement of []
- A) Energy balance
- B) Conservation of momentum for an inviscid fluid
- C) Conservation of momentum for momentum flow
- D) Conservation of momentum for a rotational fluid
21. The Euler equations of motion for the flow of an ideal fluid is derived considering the principle of conservation of []
- A) Mass and the fluid as incompressible and inviscid
- B) Momentum and the fluid as incompressible and viscous.
- C) Momentum and the fluid as incompressible and inviscid
- D) Energy and the fluid as incompressible and inviscid
22. An orifice meter, having an orifice of diameter d is fitted in a pipe of diameter D . For this orifice meter, what is the coefficient of discharge C_d []
- A) A function of Reynolds number only B) A function of d/D only
- C) A function of d/D and Reynolds number D) Independent of d/D and Reynolds number
23. How is the velocity coefficient C_v , the discharge coefficient C_d , and the contraction coefficient C_c of an orifice related []
- A) $C_v = C_c C_d$ B) $C_c = C_v C_d$ C) $C_d = C_c C_v$ D) $C_c C_v C_d = 1$
24. The instrument preferred in the measurement of highly fluctuating velocities in air is []
- A) Pitot-static tube B) Propeller type anemometer
- B) Three cup anemometer D) Hot wire anemometer

25. If a calibration chart is prepared for a hot -wire anemometer for measuring the mean velocities, the highest level of accuracy can be []
A) Equal to accuracy of a Pitot tube B) Equal to accuracy of a Rotameter
C) Equal to accuracy of a venturimeter D) More than that of the three instruments mentioned above
26. Which one of the following is measured by a Rotameter []
A) Velocity of fluid B) Discharge of fluid C) Viscosity of fluid D) None of the above
27. In a rotameter as the flow rate increase, the float []
A) Rotates at higher speed B) Rotates at lower speed C) Rises in the tube D) Drops in the tube
28. Which one of the statements is correct for a forced vortex []
A) Turns in an opposite direction to a free vortex
B) Always occurs in conjunction with a free vortex
C) Has the linear velocity directly proportional to the radius
D) Has the linear velocity inversely proportional to the radius
29. Which one of the following conditions will linearize the Navier-Stokes equations to make it amenable for analytical solutions []
A) Low Reynolds number ($Re \ll 1$) B) High Reynolds number ($Re \gg 1$)
C) Low Mach number ($M \ll 1$) D) High Mach number ($M \gg 1$)
30. For a real fluid moving with uniform velocity, the pressure []
A) Depends upon depth and orientation
B) Is independent of depth but depends upon orientation
C) Is independent of orientation but depends upon depth
D) Is independent of both depth and orientation
31. For a real fluid moving with uniform velocity, the pressure []
A) Depends upon depth and orientation
B) Is independent of depth but depends upon orientation
C) Is independent of orientation but depends upon depth
D) Is independent of both depth and orientation
32. A right circular cylinder is filled with a liquid upto its top level. It is rotated about its vertical axis at such a speed that halt the liquid spills out then the pressure at the point of intersection of the axis and bottom surface is []
A) Same as before rotation B) Half of the value before rotation
C) Quarter of the value before rotation D) Equal to the atmospheric pressure
33. An incompressible fluid flows radially outward from a line source in a steady manner. How does the velocity in any radial direction vary []

- A) r B) r^2 C) $1/r^2$ D) $1/r$
34. An instrument which offers no obstruction to the flow, offers no additional loss and is suitable for flow rate measurement is []
A) Venturimeter B) Rotameter C) Magnetic flow meter D) Bend meter
35. The device which is used to measure the discharge through a pipe or channel is []
A) Venturi meter B) Pitot tube C) Mouth pieces D) None of the above
36. The device which is used to measure the velocity through a pipe or channel is []
A) Venturi meter B) Pitot tube C) Mouth pieces D) None of the above
37. Which of the following is the impulse momentum equation []
A) $F \cdot dt = d(mv)$ B) $F = d(mv)$ C) $F \cdot dt = d(m)$ D) $dt = d(mv)$
38. The rate of change of linear momentum is equal to []
A) Active force B) Reactive force C) Torque D) Work done
39. Energy loss in flow through nozzle as compared to venturimeter is []
A) Same B) More C) Less D) Unpredictable
40. Hot wire anemometer is used to measure []
A) Pressure in gasses B) Liquid discharge C) Pressure in liquids D) Gas velocities

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