SHRI ANGALAMMAN COLLEGE OF ENGINEERING AND TECHNOLOGY
(An ISO 9001: 2008 CERTIFIED INSTITUTION)
SIRUGANOOR, TRICHY-621 105

FS81 504

DEPARTMENT OF CIVIL ENGINEERING

CE1203- MECHANICS OF FLUIDS

UNIT – I- DEFINITIONS AND FLUID PROPERTIES
PART – A

1. Distinguish between real and ideal fluids.
2. State Newton's law of viscosity.
3. What is known as capillarity?
4. What is the difference between cohesion and adhesion?
5. Some insects can walk on water. How?
6. Differentiate between specific weight and specific volume of a fluid.
7. How does viscosity of a fluid vary with temperature?
8. Define and explain Newton's low of viscosity.
9. Convert 1 kg/s-m dynamic viscosity in poise.
10. Define Newtonian and non-Newtonian fluids.
11. Explain the phenomenon of capillarity. Obtain an expression for capillary rise of a liquid.
12. Difference between liquids and gases.
13. State the Newton's law of viscosity and give examples of it's application.
14. Define isothermal process.
15. Define adiabatic process.

PART – B

1. One liter of crude oil weighs 9.6N, calculate its specific weight, density, specific volume and specific gravity.
2. In a stream of glycerin in motion, at a certain point the velocity gradient is 0.25 meter per sec per meter. The mass density of fluid is 1268.4 kg per cubic meter and kinematics viscosity is 6.30×10^{-4} square meter per second. Calculate the shear force at that point.
3. What do you understand by the terms isothermal process and adiabatic process?
4. Determine the minimum size of glass tubing that can be used to measure water level, if the capillary rise in the tube is not to exceed 0.25 mm. take surface tension of water in contact with air as 0.0732N/m.
5. Determine the bulk modulus of elasticity of a liquid, if as the pressure of the liquid is increased from 7 MN/m² to 13MN/m² the volume of liquid decreased by 0.15%.
6. Determine the mass density, specific volume and specific volume and specific weight of a liquid whose specific gravity is 0.85.

7. A cylindrical shaft of 90mm rotates about a vertical axis inside a cylindrical tube of length 50 cm and 95 cm internal diameter. If the space between them is filled with oil of viscosity 2 poise find the power lost in friction for a shaft speed of 200rpm.
8. Obtain an expression for capillary rise of a liquid.
9. Define surface tension and obtain the relationship between surface tension and pressure inside a droplet of liquid in excess of outside pressure.
10. Find the surface tension in a soap bubble of 30mm diameter when the inside pressure is 1.962 n/m^2 above atmosphere.

UNIT – II - FLUID STATICS AND KINEMATICS

PART – A

1. State and prove the Pascal's law.
2. What do you understand by hydrostatic law?
3. What is a manometer? How are they classified?
4. What do you mean by vacuum pressure?
5. What do you understand by total pressure and centre of pressure?
6. Define the terms buoyancy and centre of buoyancy.
7. Define the terms : meta-centre
8. What are the methods of describing fluid flow?
9. Explain the terms; path line, stream line.
10. Distinguish between laminar and turbulent flow.
11. Define the following and give one practical example for each: laminar flow
12. Define steady flow
13. Define turbulent flow
14. Explain the terms: stream tube
15. Define streak line.

PART – B

1. A solid wood cylinder is with a diameter of 0.666 m and a height of 1.3 m. the specific gravity of the wood is 0.61. Would the cylinder be stable if places vertically in oil of specific gravity 0.85?
2. Give the definitions of metacentre and metacentirc height.
3. Derive the equation of continuity for three dimensional incompressible fluid flows and reduce it to one dimensional form.
4. A hollow cylinder closed at both ends has an outside diameter of 1.25m, length 3.5m and specific weight 75KN/m^3. it the cylinder is to float just in stable equilibrium in sea water (specific weight 10 KN/m^3) , find its minimum permissible thickness.

5. What is a flow - net"? Enumerate the methods of drawing flow nets. What are the uses and limitations of flow nets?
6. State and prove the hydrostatic law.
7. Determine the gauge and absolute pressure at a point which is 2m below the free surface of dewater. Take atmospheric pressure as 10.1093n/m².
8. A rectangular tank 4m long, 1.5m wide contains water up to a height of 2m. Calculate the force due to water pressure on the base of the tank. Find also the depth of centre of pressure from free surface.
9. A block of wood of specific gravity 0.7. Floats in water. Determine the meta-centric height of the block it its' size is 2mx1mx0.8m.
10. A 25cm diameter pipe carries oil specific gravity 0.9 at a velocity of 3m/s. at another section the diameter is 20cm. find the velocity at this section and also mass rate of flow of oil.

UNIT – III - FLUID DYNAMICS
PART – A

1. What is the use of Moody's diagram?
2. Which is called as equivalent pipe?
3. State a few engineering application of the momentum equation.
4. How does turbulence affect the flow properties?
5. Sketch the velocity distribution diagram for laminar flow occurring through a circular pipeline.
6. State the assumptions used in deriving Bernoulli's equation.
7. What is venturimeter?
8. Define an orifice-meter.
9. State Bernoulli's theorem.
10. Define continuity equation.
11. Define moment of momentum equation.
12. What is free jet of liquid?
13. What is Euler's equation of motion?
14. What is Euler's equation of motion?
15. What is a pitot-tube?

PART – B

1. The water is flowing through a pipe having diameters 200 mm and 100 mm at sections 1 & 2 respectively. The rate of slow through the pipe is 35 l/s. the section 1 is 2 m above datum and section 2 is 4 m above datum. If the pressure at section 1 is KN/m², find the intensity of pressure at section 2.

2. Derive Euler's equation of motion along a stream line and hence derive the Bernoulli's theorem.
3. Derive the Hagen - Poiseuille equation and state the assumptions made.
4. Give the equation for difference of pressure head for laminar flow between two fixed parallel plates with details.
5. Explain in detail about drag and lift coefficients.
6. Briefly explain about Moody's diagram, pipe roughness.
7. A pipe of diameter 400mm carries water at a velocity of 25m/s .the pressure at the points and a and b are given as 29.43n/m²and 22.563n/m² respectively while the datum head at a& b are 28m & 30m. Find the loss of head between a & b.
8. A nozzle of diameter 20mm is fitted to a pipe of diameter 40mm. find the force exerted by the nozzle on the water which is flowing through the pipe at the rate of 1.2m³/minute.
9. State Bernoulli's theorem for steady flow of an incompressible fluid.
10. Assumption's of Bernoulli's theorem.

UNIT – IV- BOUNDARY LAYER AND FLOW THROUGH PIPES

PART – A

1. Define an equivalent pipe.
2. Give four examples in everyday life where formation of boundary layer is important.
3. Mention the characteristics of parallel pipes.
4. Define boundary layer thickness
5. What is called as equivalent pipe?
6. What is pipe network?
7. What is meant by boundary layer?
8. Define displacement thickness?
9. What are the different methods of preventing the separations of boundary layers?
10. What do you understand by the terms: major energy loss and energy losses in pipes?
11. Define the term: total energy line.
12. What is siphon?
13. What is compound pipe?
14. Explain the term: pipes in parallel.
15. What is pipe in series?

PART – B

1. Derive the expression for momentum thickness of boundary layer.
2. Derive the expression for head loss due to friction for a pipe flow.

3. A 146.3 m long 45.7 cm diameter concrete pipe and a 179.8 m long 30.48 cm diameter concrete pipe are connected in series. Calculate the length of an equivalent of 25.4 cm diameter.
4. Explain briefly pipe network.
5. A crude oil of kinematic viscosity 0.4 stoke is flowing through a pipe of diameter 300mm at the rate of 300 liters per sec. find the head lost due to friction for a length of 50m of the pipe.
6. Find the loss of head when a pipe of diameter 200mm is suddenly enlarged to a diameter of 400mm. the rate of flow of water through the pipe is 250 l/s.
7. At a sudden enlargement of a water main from 240mm to 480mm diameter, the hydraulic gradient rises by 10mm. estimate the rate of flow.
8. A 150mm diameter pipe reduces in diameter abruptly to 100mm.if the pipe carries water at 30l/s. calculates the pressure loss across the contraction. Take the co-efficient of contraction as 0.6.

UNIT – V - SIMILITUDE AND MODEL STUDY

PART – A

1. State the applications of dimensional analysis.
2. Define Reynolds model law.
3. What is meant by repeating variables?
4. What are distorted models?
5. Define Buckingham's pi-theorem.
6. What is Reynolds's number?
7. Define the terms dimensional analysis and model analysis.
8. Define the term model analysis?
9. What do you mean by dimensionless numbers?
10. What do you mean by fundamental units and derived units? Give examples?

PART – B

1. Briefly explain Rayleigh's method.
2. Briefly explain Buckingham's pi-theorem.
3. The resisting force of a supersonic aircraft during its flight can be assured to depend on following variables such as length, velocity, visocity, and density and bulk modulus. With the help of Buckingham π theorem derive an expression showing the relationship between resisting force and these variables.