Course Code: 23CE0107 **R23**

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code: Fluid Mechanics (23CE0107) **Course & Branch**: B.Tech & CE

Year & Sem: II B.Tech & I Sem **Regulation: R23**

UNIT –I
BASIC CONCEPTS AND DEFINITIONS

1	a) Define specific gravity? b) Define fluid? c) Define density. d) What is capillarity? e) Write the types of fluids.	**[L1][CO1]** **[L1][CO1]** **[L1][CO1]** **[L1][CO1]** **[L1][CO1]**	**[2M]** **[2M]** **[2M]** **[2M]** **[2M]**
2	Define the physical properties of fluids and Write its units?	**[L1][CO1]**	**[10M]**
3	a) Differentiate between solid and fluid.	**[L3][CO1]**	**[5M]**
	b) What is a fluid? Explain the fluids classification.	**[L2][CO1]**	**[5M]**
4	Explain briefly the following terms: i)Density ii)Specific weight iii)Specific volume iv)Specific gravity	**[L2][CO1]**	**[10M]**
5	a) Define viscosity and its S.I units?	**[L1][CO1]**	**[5M]**
	b) Two horizontal plates are placed 1.25cm apart, the space between them filled with oil of viscosity 14 Poise. Calculate the Shear Stress in oil if upper plate is moved with velocity of 2.5 m/sec.	**[L4][CO1]**	**[5M]**
6	The space b/w two square parallel plates filled with oil. Each side of the plate is 60 cm. The thickness of oil film is 12.5. The upper plate which moves at 2.5m/sec requires a force 98.1 N to maintain the speed. Determine the i) Dynamic viscosity of oil in poise. ii) Kinetic viscosity of the oil in stokes, If the specific gravity of the oil 0.95.	**[L3][CO1]**	**[10M]**
7	Define the terms i)viscosity ii)capillarity iii)surface tension	**[L1][CO2]**	**[10M]**
8	a) Explain the phenomenon of capillarity. Obtain an expression for capillary rise of a liquid.	**[L2][CO2]**	**[5M]**
	b) Calculate the capillary rise in a glass tube of 2.5mm diameter when immersedvertically in a) water & b) mercury .Take surface tension is 0.0725 N/m^2 for water And 0.52 N/m^2 for mercury in contact with air. The specific gravity for mercury is Given as 13.6 & angle of contact is 130^0	**[L4][CO2]**	**[5M]**
9	a) Derive the expression for surface tension on liquid droplet and soap bubble.	**[L2][CO2]**	**[5M]**
	b) Define the term vapour pressure. How does it vary with temperature?	**[L2][CO2]**	**[5M]**
10	Explain the following: i) Surface Tension ii) Vapour Pressure iii) Compressibility	**[L2][CO2]**	**[10M]**
11	a) Explain the compressibility. Derive equation for capillary rise and fall.	**[L2][CO2]**	**[5M]**
	b) When the pressure of liquid is increased from 3.5 MN/m^2 to 6.5 MN/m^2 its volume is found to decrease by 0.08 percent. Calculate the bulk modulus of elasticity of the liquid?	**[L2][CO2]**	**[5M]**

Course Code: 23CE0107 **R23**

UNIT –II
FLUID STATICS

1	a) Define manometer? b) State Pascal's law? c) Define buoyancy? d) Define fluid pressure? e) What is Centre of buoyancy?	**[L1][CO2]** **[L1][CO2]** **[L1][CO2]** **[L1][CO2]** **[L1][CO2]**	**[2M]** **[2M]** **[2M]** **[2M]** **[2M]**
2	Define fluid pressure and Derive pressure at a point in a fluid?	**[L2][CO2]**	**[10M]**
3	State Pascal's law and pressure variation with temperature, density and altitude?	**[L2][CO2]**	**[10M]**
4	Explain briefly the following terms: i)piezometer ii)single column manometer	**[L2][CO2]**	**[10M]**
5	a) Explain briefly the working principle of piezometer and U-Tube manometer with a neat sketch.	**[L2][CO2]**	**[5M]**
	b) Explain briefly the working principle of piezometer and U-Tube differential manometer with a neat sketch.	**[L2][CO2]**	**[5M]**
6	Explain briefly the pressure gauges	**[L2][CO2]**	**[10M]**
7	a) Define Total pressure and Centre of Pressure?	**[L1][CO2]**	**[5M]**
	b) Derive the expression for Total Pressure of horizontal plane surface	**[L2][CO2]**	**[5M]**
8	a) Derive the expression for Total Pressure of vertical plane surface.	**[L2][CO2]**	**[5M]**
	b) Derive the expression for Center of Pressure of vertical plane surface.	**[L2][CO2]**	**[5M]**
9	A rectangular plane surface is 2m wide and 3m deep it lies in vertical plane in water. Calculate the Total pressure and position of Centre of pressure on the plane surface when its appear edge is horizontal and: a)Coincides with water surface b)2.5 m below the free surface.	**[L4][CO2]**	**[10M]**
10	a) Derive the expression for Total Pressure of inclined plane surface.	**[L2][CO2]**	**[5M]**
	b) Derive the expression for Center of Pressure of inclined plane surface.	**[L2][CO2]**	**[5M]**
11	a)What is buoyancy and Centre of buoyancy?	**[L1][CO2]**	**[5M]**
	b) Discuss about stability of floating bodies.	**[L2][CO2]**	**[5M]**

Course Code: 23CE0107 **R23**

UNIT-III
FLUID KINEMATICS

1	a) Define laminar flow? b) Define compressible flow? c) List the types of fluid flows. d) Define stream line? e) Write the formula for three dimensional continuity equation.	**[L1][CO3]** **[L1][CO3]** **[L1][CO3]** **[L1][CO3]** **[L1][CO3]**	**[2M]** **[2M]** **[2M]** **[2M]** **[2M]**
2	Explain in detail about different types of flow.	**[L2][CO3]**	**[10M]**
3	a) Define stream line, streak line and path line, stream tube?	**[L1][CO3]**	**[5M]**
	b) Write a brief note on continuity equation for a one- dimensional flow.	**[L1][CO3]**	**[5M]**
4	A 30 cm dia. pipe conveying water branches into two pipes of dia. 20 cm and 15 cm respectively. If the average velocity in the 30 cm dia. pipe is 2.5 m/s. Find the discharge in this pipe. Also determine the velocity in 15 cm pipe. If the average velocity in 20 cm diameter pipe is 2 m/s.	**[L3][CO3]**	**[10M]**
5	a) Explain in detail about Velocity Potential Function and write its properties.	**[L2][CO3]**	**[5M]**
	b) The velocity vector in a fluid flow V= $4x^3$i-$10x^2$yj+2tk, Calculate the velocity and acceleration of a fluid particle at (2, 1, 3) at time t=1.	**[L4][CO3]**	**[5M]**
6	a) Explain about the stream function. Also write its properties.	**[L2][CO4]**	**[5M]**
	b)The Stream function for a Two-dimensional flow is given by Q = 2xy. Calculate the velocity at the point P(2,3). Find the velocity potentialø .	**[L4][CO4]**	**[5M]**
7	i)Define compressible and incompressible flows? ii)Define laminar and turbulent flows? iii)Define uniform and non uniform flow? iv)Distinguish between rotational and irrotational flow? v)Distinguish between steady and unsteady flow.	**[L1][CO4]**	**[10M]**
8	a) The velocity potential function is given by Ø = $5(x^2 – y^2)$. Calculate the velocity components atthe point (4, 5).	**[L4][CO4]**	**[5M]**
	b)A stream function is given by ψ = 5x – 6y. Calculate the velocity components and also magnitudeand direction of the resultant velocity at any point.	**[L4][CO4]**	**[5M]**
9	The Velocity Potential function (ø) is given by an expression $\emptyset = -xy3/3 - x^2 + x^3y/3 + y^2$. Find i.the velocity components in x and y direction. ii. Show that øremains represents the possible case of flow.	**[L2][CO4]**	**[10M]**
10	Obtain an expression for continuity equation for a three - dimensional flow.	**[L2][CO4]**	**[10M]**
11	a) Explain the continuity equation for One-dimensional flow in terms of Rate of flow.	**[L2][CO4]**	**[5M]**
	b) The dia. of pipe at the section 1 & 2 are 10 cm and 15 cm respectively. Find the discharge through the pipe. If the velocity of water flowing through the pipe at section 1 is 5 m/s. Determine also the velocity at the section 2.	**[L3][CO4]**	**[5M]**

Course Code: 23CE0107 **R23**

UNIT-IV
FLUID DYNAMICS

1	a)Define the Bernoulli's Equation? b)Define pitot tube? c)Write the Bernoulli's equation. d)Define Reynolds number? e)Define vortex flow?	**[L1][CO5]** **[L1][CO5]** **[L1][CO5]** **[L1][CO5]** **[L1][CO5]**	**[2M]** **[2M]** **[2M]** **[2M]** **[2M]**
2	What is Euler's equation of motion? How do you obtain Bernoulli's equation from it?	**[L2][CO5]**	**[10M]**
3	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.	**[L2][CO5]**	**[10M]**
4	Derive the expression for actual discharge in venturimeter.	**[L2][CO5]**	**[10M]**
5	a)The water is flowing through a pipe having diameter of 20 cm and 10 cm at section & 2 respectively. The rate of flow through pipe is 35 lit/sec. The section 1 is 6m above the datum and section 2 is 4m above the datum. If the pressure at the section 1 is 39.24 N/cm^2. Calculate the intensity of pressure at the section 2.	**[L4][CO5]**	**[5M]**
	b)An oil of Sg=0.8 is flowing through a venturimeter having inlet diameter 20cm and throat dia 10cm . the oil – Hg differential manometer shows a reading of 25 cm . calculate discharge of oil through horizontal venturimeter? take Cd =0.98	**[L4][CO5]**	**[5M]**
6	a)Explain Pitot tube with neat sketch .	**[L2][CO5]**	**[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. Determine 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	**[L3][CO5]**	**[5M]**
7	Derive the expression for actual discharge orifice meter.	**[L2][CO5]**	**[10M]**
8	State the momentum equation.How will you apply momentum equation for determining the force exerted by a flowing liquid on a pipe bend?	**[L2][CO5]**	**[10M]**
9	What is flowing through a pipe of 5 cm diameter under a pressure of 29.43N/cm3 (gauge) and with mean velocity of 2.0 m/s. Determine the total head or total energy per unit weight of the water at a cross section which is 5 m above the datum line.	**[L3][CO5]**	**[10M]**
10	An orifice metre with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter.the pressure difference measured by a Mercury oil differential manometer on the two sides of the orifice metre gives a reading of 50 cm of Mercury.Determine the rate of flow of oil of sp.gr.0.9 when the coefficient of discharge of the orifice meter 0.64.	**[L3][CO5]**	**[10M]**
11	Define i)Reynolds number, ii)Froude number, iii)Mach number, iv)Weber number, v)Euler number.	**[L2][CO5]**	**[10M]**

Course Code: 23CE0107 **R23**

UNIT-V

ANALYSIS OF PIPE FLOW

1	a) Write the Darcy –Weisbach formula. b) Write the Chezy's formula. c) Define total energy line? d) Define hydraulic gradient line? e) What are the various minor losses?	**[L1][CO6]** **[L1][CO6]** **[L1][CO6]** **[L1][CO6]** **[L1][CO6]**	**[2M]** **[2M]** **[2M]** **[2M]** **[2M]**
2	Derive the expression for head loss in pipes due to friction by Darcy - Weisbach equation and chezy's formula	**[L2][CO6]**	**[10M]**
3	Find the head lost due to friction in a pipe of dia 300mm & length 50m through which water is flowing at a velocity of 3 m/s using : **a)** Darcy's formula **b)** Chezy's formula for which C = 60. Take kinematic viscosity of for water=0.01 stoke?	**[L2][CO6]**	**[10M]**
4	What do you understand by the term: major and minor losses in pipes?	**[L2][CO6]**	**[10M]**
5	Define i)Hydraulic gradient line ii)Total energy line iii)Equivalent pipe	**[L1][CO6]**	**[10M]**
6	a)Derive the expression for flow through pipes in series.	**[L2][CO6]**	**[5M]**
	b)Derive the expression for flow through parallel pipes.	**[L2][CO6]**	**[5M]**
7	A horizontal pipe line 40m long is connected to the water tank at one end and discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank pipe is 150mm and its dia is suddenly enlarged to 300mm. the height of water level in the tank is 8m above the center of pipe considering all losses of head which cover occur. Determine the rate of flow. Take f = 0.01, for both sections of the pipe?	**[L3][CO6]**	**[10M]**
8	The rate of flow water through a horizontal pipe of 0. 25m m^3/s. The dia of the pipe which is 200mm is suddenly enlarged to 400mm. the pressure intensity in the smaller pipe is 11.772 N/cm^2. Determine i) Loss of head due to sudden enlargement ii) Pressure intensity in the large pipe iii) power lost due to enlargement?	**[L3][CO6]**	**[10M]**
9	Three pipes of lengths 800m, 500m & 400m & of dia 500mm, 400mm & 300mm respectively are connected in series. These pipes are replaced by a single pipe of length 1700m. Calculate the dia of the single pipe?	**[L4][CO6]**	**[10M]**
10	A main pipe divides into two parallel pipes which again forms one pipe as shown in figure. Above the length & and dia for the first parallel pipe are 2000m & 1.0m respectively. While the length & dia of 2^{nd} parallel pipe are 2000m & 0.8m. Calculate the rate of flow in each parallel pipe if total flow in the main is 3.0 m^3/s. the coefficient of friction for each parallel pipe is same & equal to 0.005?	**[L4][CO6]**	**[10M]**
11	A crude oil of kinematic viscosity 0.4 stoke is flowing through a pipe of dia 300mm at the rate of 300 lit/s. Determine the head lost due to friction for a length of 50m of the pipe?	**[L3][CO6]**	**[10M]**

Prepared by : A.Jyoshna,Assistant professor,CE.