9. OLD QUESTION PAPERS

R18

Code No: 153AX

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, December - 2019
FLUID MECHANICS
(Civil Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A **(25 Marks)**

1.a) How the pressure can be measured by a manometer? [2]
b) What is flow net? [2]
c) What are practical applications of Bernoulli's equation? [2]
d) What is an equivalent pipe? [2]
e) What do you mean by Laminar sub layer? [2]
f) Define the term fluid. Distinguish between liquid and gas. [3]
g) Describe assumptions and limitations of Bernoulli's theorem. [3]
h) Explain the working principle of an orifice meter. [3]
i) Define the term Vena Contract. [3]
j) Illustrate the examples of formation of boundary layer in day to day life. [3]

PART – B **(50 Marks)**

2.a) Derive expression for total pressure and Centre of pressure for a vertically immersed surface?
b) A 18 cm diameter vertical cylinder rotates concentrically inside another cylinder of diameter 15.50 cm. Both cylinders are 28 cm high. The space between the cylinders is filled with a liquid whose viscosity is unknown. If a torque of 12.0 Nm is required to rotate the inner cylinder at 120 rpm determine the viscosity of the fluid. [5+5]

OR

3.a) What is Viscosity? Differentiate clearly between dynamic viscosity and kinetic viscosity.
b) A wooden block 4 m × 1.2 m × 0.5 m is floating in water. Its specific gravity is 0.76. Find the volume of concrete of specific gravity 2.5, that may be placed on the block which will immerse the i) block completely in water ii) block and concrete in water. [5+5]

4.a) Write the expression for the resultant force acting between two sections of the pipe in terms of discharge using impulse-momentum principle.
b) The stream function for a dimensional flow is given by $\Psi = 2xy$. Calculate the resultant velocity at P(3,4). Also the velocity potential function φ. [5+5]

OR

5.a) Derive the Bernoulli's equation from Euler's equation of motion? Write Application of Bernoulli's theorem for steady flow of an incompressible fluid.
b) The water is flowing through a pipe having diameter 20 cm and10cm at sections 1 and 2 respectively. The rate of flow through pipe is 3.5 lits / sec. This section 1 is 6 m above datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 N/cm^2, find the intensity of pressure at section 2. [5+5]

6.a) What are the advantages of a triangular notch over a rectangular notch?

b) A 400 × 200 mm venturimeter is provided in a vertical pipe line carrying oil of relative density 0.9, the flow being upwards. The difference in elevation of the throat section and entrance section of the venturimeter is 30 cm. The differential U tube mercury manometer shows a gauge deflection of 250 mm. calculate the discharge of oil, if the coefficient of meter is 0.98. [5+5]

OR

7.a) Derive an expression for the time required to empty a tank with a rectangular notch.

b) The diameter of pipe bend is 0.4m at inlet and 0.2m at outlet and the flow is turned through 120^0 in a vertical plane. The axis at inlet is horizontal and the centre of the outlet section is 1m below the centre of inlet section. The total volume of fluid contained in the bend is $0.09m^3$. Neglecting friction, calculate the magnitude and direction of force exerted on the bend by the water flowing through it at $0.4m^3$ /s when the inlet pressure is $140 kN/m^2$. [5+5]

8.a) Derive an expression for the power transmission through the pipes. Find also the condition for maximum transmission of power?

b) The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300 m, 170 m and 210 m and of diameters 300 mm, 200 mm and 400 mm respectively, is 12m. Determine the rate of flow of water if co – efficient of friction are 0.005, 0.0052 and 0.0048 respectively, considering: (i) minor losses also (ii) neglecting minor losses. [5+5]

OR

9.a) What are the factors influencing the frictional loss in pipe flow?

b) A pipe line of length 2000 m is used for power transmission. If 110.3625 kW power is to be transmitted through the pipe in which water having a pressure of $490.5 N/cm^2$ at inlet is flowing. Find the diameter of the pipe and efficiency of transmission if the pressure drop over the length of pipe is $98.1 N/cm^2$. Take f = 0.0065. [5+5]

10.a) Distinguish between local co-efficient of drag and average co-efficient of drag.

b) In a circular pipe of diameter 100 mm a fluid of viscosity 7 poise and specific gravity 1:3 is flowing. If the maximum shear stress at the wall of the pipe is $196.2 N/m^2$. Find i) The pressure gradient ii) The average velocity. [5+5]

OR

11.a) Explain the characteristics of laminar and turbulent boundary layer.

b) Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $u/U = y/\delta$, where u is the velocity at a distance y from the plate and u = U at $y = \delta$, where δ = boundary layer thickness. Also calculate the value of δ^*/θ. [5+5]

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Code No: 133AV **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December - 2018
FLUID MECHANICS – I
(Common to CE, CEE)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A **(25 Marks)**

1.a) Distinguish between specific weight and specific gravity. [2]
b) Explain bulk modulus and compressibility. [3]
c) What is velocity potential function? [2]
d) What is meant by liquids in relative equilibrium? [3]
e) What is broad crested weir? [2]
f) Explain Navier Stoke's equation along with its significance. [3]
g) List out all major and minor losses. [2]
h) Explain what water hammer is. [3]
i) Explain Prandtl boundary layer equations. [2]
j) What is magnus effect? Explain. [3]

PART-B **(50 Marks)**

2.a) Differentiate between:
i) Liquids and Gases
ii) Cohesion and Adhesion
iii) Real fluid and Ideal fluid
iv) Compressible and Incompressible fluids.

b) In a stream of glycerin in motion, the velocity gradient at a certain point is 0.30 meters per sec per meter. Calculate the shear stress at the point if the mass density of the liquid is 1275 kg/m^3 and the kinematic viscosity is 6.30 $\times 10^{-4}$ sq.m/sec. [5+5]

OR

3.a) Distinguish between (i) standard and local atmospheric pressures, (ii) barometric pressure and absolute pressure and (iii) absolute pressure and gauge pressure.

b) Determine the intensity of shear of an oil having viscosity = 1.2 poise and is used for lubrication in the clearance between a 10 cm diameter shaft and its journal bearing. The clearance is 1.0 mm and shaft rotates at 200 rpm. [5+5]

4.a) Define the equation of continuity. Obtain an expression for continuity equation for a three dimensional flow.

b) Water is flowing through a pipe having diameters 30 cm and 15 cm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 29.43 N/cm^2 and the pressure at the upper end is 14.715 N/cm^2. Determine the difference in datum head if the rate of flow through pipe is 50 lit/s. [5+5]

OR

5. Write short note on:
   a) Buoyancy and flotation
   b) Circulation and Vorticity
   c) Flow net. [10]

6.a) Derive Bernoulli's equation for the flow of an incompressible frictionless fluid from consideration of momentum.

b) A 45^0 reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 40 cm and 20 cm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet of bend is 21.58 N/cm^2. The rate of flow of water is 500 liters/s. [5+5]

OR

7.a) Explain the momentum equation along with its applications.

b) A 10 cm by 6 cm orifice meter is used to measure the discharge of bromine. If the pressure difference across the orifice plate is 18250 N/m^2, determine the discharge in lit/m. Assume Cd = 0.64. Specific gravity of bromine = 3.1. [5+5]

8.a) Obtain an expression for head loss due to friction in the pipe. List all the assumptions made in the derivation.

b) Explain how the following flow problems are analyzed:
(i) Series pipe connection and (ii) parallel pipe connection. [5+5]

OR

9.a) Describe Reynolds experiment with a neat sketch.

b) A horizontal pipe of diameter 400 mm is suddenly contracted to a diameter of 200 mm. The pressure intensities in the large and smaller pipe are given as 14.715 N/cm^2 and 12.753 N/cm^2 respectively. If Cc = 0.62, find the loss of head due to contraction. Also determine the rate of flow of water. [5+5]

10.a) Describe Von-Karman's momentum integral equation. What is the significance of it?

b) Explain what is meant by drag, lift and Magnus effect. [5+5]

OR

11.a) What do you mean by boundary layer separation. What is the effect of pressure gradient on boundary layer separation?

b) How will you find the drag on a flat plate due to laminar and turbulent boundary layers? [5+5]

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R16

Code No: 133AV

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, April/May - 2018

FLUID MECHANICS – I

(Common to CE, CEE)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART-A **(25 Marks)**

1.a)	Differenciate between atmospheric pressure and gauge pressure.	[2]
b)	Explain the terms- intensity of pressure and pressure head.	[3]
c)	Explain the terms: Metacentre and metacentric height.	[2]
d)	Write short notes on rotational and irrotational flows.	[3]
e)	What are the applications of momentum equation?	[2]
f)	Define the terms forced vortex and free vortex flow.	[3]
g)	What do you understand by total energy line, hydraulic gradient line?	[2]
h)	Explain the terms Pipes in parallel and series.	[3]
i)	Explain the concept of boundary layer.	[2]
j)	How is the flow in boundary layer controlled?	[3]

PART-B **(50 Marks)**

2.a) Briefly explain the principle employed in the manometers used for the measurement of pressure.

b) State the advantages of mechanical pressure gauges over the manometers. [5+5]

OR

3.a) Describe with the help of neat sketches, different types of manometers.

b) A vertical gap 2.2 cm wide of infinite extent contains a fluid of viscosity 2.0 N s/m^2 and specific gravity 0.9. A metallic plate 1.2m × 1.2m × 0.2 cm is to be lifted up with a constant velocity of 0.15 m/sec, through this gap. If the plate is in the middle of the gap, find the force required. The weight of the plate is 40N. [5+5]

4.a) Describe briefly the experimental method of determination of the metacentric height of a floating object.

b) What is a flow net? What are its uses? Give examples. [5+5]

OR

5.a) Velocity potential of a certain flow field is given as: $\emptyset = 4xy$. Check whether the stream function exists or not? If exists, obtain an expression for stream function for the flow. Sketch the streamline of the flow.

b) Explain the following terms in brief: i) Circulation ii) Vorticity. [5+5]

6.a) Derive Bernoulli's equation from Euler's equation of motion.

b) During an experiment in a laboratory, $0.05m^3$ of water flowing over a right-angled notch was collected in one minute. If the head of the sill is 50 mm, calculate the co-efficient of discharge of the notch. [5+5]

OR

7.a) Derive Euler's equation of motion.

b) Why is co-efficient of discharge of an orifice meter much smaller than that of venturimeter? [5+5]

8. A pipeline 0.225 m in diameter and 1580 m long has a slope of 1 in 200 for the first 790 m and 1 in 100 for the next 790m. The pressure at the upper end of the pipeline is 107.91 kP_a and at the lower end is 53.955 kP_a. Taking f= 0.032, determine the discharge through the pipe. [10]

OR

9.a) What is meant by water hammer? Obtain an expression for the rise in pressure in a thin elastic pipe of circular section in which the flow of water is stopped by sudden closure of valve.

b) How will you determine the loss of head due to friction in pipes by using Darcy formula? [5+5]

10. State the assumptions under which the boundary layer equations for flow over a flat plate are valid. Explain with a neat sketch the boundary layer characteristics when a fluid is flowing over a flat plate. [10]

OR

11. Obtain Von-Karman momentum integral equation. [10]

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R16

Code No: 133AV

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, November/December - 2017

FLUID MECHANICS – I

(Common to CE, CEE)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A **(25 Marks)**

1.a)	State and explain Pascal's law.	[2]
b)	Differentiate centre of gravity and centre of pressure.	[3]
c)	Differentiate fluid statics and kinematics.	[2]
d)	State and explain continuity equation.	[3]
e)	Distinguish between surface and body forces.	[2]
f)	Describe the classification of orifices.	[3]
g)	Explain how flow takes place in closed conduits.	[2]
h)	Explain HGL and TEL with a neat sketch.	[3]
i)	Give Navier Stoke's equation.	[2]
j)	Distinguish between drag and lift.	[3]

PART-B **(50 Marks)**

2.a) Define Viscosity, Surface tension and Vapor Pressure and explain their influence on fluid motion.

b) An open tank contains water up to a depth of 1.5 m and above it an oil of sp.gr.0.8 for a depth of 2 m. Find the pressure intensity: (i) at the interface of the two liquids, and (ii) at the bottom of the tank. [5+5]

OR

3.a) Distinguish between:
i) specific weight and specific volume,
ii) density and relative density and
iii) adhesion and cohesion.

b) 10 m^3 of carbon tetrachloride reduces in volume by 0.11 percent when subjected to certain pressure increase. If the bulk modulus of the fluid is $1.145\times10^6\ N/m^2$, the original specific weight is 15,750 N/ m^3, calculate the increase in pressure and the final specific weight. [5+5]

4.a) Distinguish between: (i) Steady flow and un-steady flow, (ii) Uniform and non-uniform flow, (iii) Compressible and incompressible flow, (iv) Rotational and Irrotational flow (v) Laminar and turbulent flow.

b) A 100 mm diameter pipe carries oil of specific gravity 0.8 which flows with a velocity of 2 m/s. At another section of the pipe, the diameter is 50 mm. Determine the mass flow rate of oil through the pipe and velocity of oil at the smaller section. [5+5]

OR

5.a) Explain stream function and velocity potential function.

b) Examine whether the following velocity components represent a possible incompressible two-dimensional flow. If so, state whether the flow is rotational or irrotational $u = 2x+y$ and $v = x-2y$. [5+5]

6.a) What is a Venturimeter? Derive an expression for the discharge through a Venturimeter.

b) An orifice-meter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter give readings of 14.715 N/cm^2 and 9.81 N/cm^2 respectively. Find the rate of flow of water through the pipe in liters/s. Take Cd = 0.6. [5+5]

OR

7.a) Derive Bernoulli's equation for the flow of an incompressible frictionless fluid from consideration of momentum.

b) A 45^0 reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 40 cm and 20 cm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet of bend is 21.58 N/cm^2. The rate of flow of water is 500 liters/s. [5+5]

8.a) What do you mean by equivalent pipe. Obtain an expression for equivalent pipe.

b) A pipe of diameter 300 mm and length 1000 m connects two reservoirs, having difference of water levels as 15 m. Determine the discharge through the pipe. If an additional pipe of diameter 300 mm and length 600 m is attached to the last 600 m length of the existing pipe, find the increase in the discharge. Take f = 0.02 and neglect minor losses. [5+5]

OR

9.a) Show that the loss of head due to sudden expansion in pipe line is a function of velocity head.

b) Describe the characteristics of laminar and turbulent flows. [5+5]

10.a) What is meant by boundary layer separation? What is the effect of pressure gradient on boundary layer separation?

b) Explain the factors affecting boundary layer thickness. [5+5]

OR

11.a) Explain the terms boundary layer, laminar sub-layer and point of separation.

b) Describe the characteristics of boundary layer with reference to flow over a flat plate. [5+5]

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R15

Code No: 123BK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2017
FLUID MECHANICS
(Common to CE, CEE)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART – A

(25 Marks)

1.a) Explain hydrostatic law. [2]
b) Explain vacuum pressure. [3]
c) Define steady and unsteady flow. [2]
d) Explain stream and velocity potential functions. [3]
e) List the assumptions of Euler's equation of motion. [2]
f) Write down the disadvantages of orifice meter. [3]
g) What is Magnus effect? [2]
h) Write a brief note on Prandtl contribution. [3]
i) List the characteristics of turbulent flow. [2]
j) Explain total energy line. [3]

PART - B

(50 Marks)

2.a) Define the following:
i) Atmospheric pressure
ii) Gauge pressure
iii) Vacuum pressure and
iv) Absolute pressure
b) What are mechanical gauges? Name three important mechanical gauges. [5+5]

OR

3.a) Define the following terms:
i) Total pressure, and
ii) Centre of pressure.
b) Derive expression for total pressure and centre of pressure for a vertically immersed surface. [5+5]

4. Find the velocity and acceleration at a point (1, 2, 3) after 1 sec, for a three dimensional flow given by $u = yz + t, v = xz - t, w = xy$ m/s. [10]

OR

5. Describe in detail the classification of flows given one example for each category. [10]

6. A 300 mm × 150 mm venturimeter is provided in a vertical pipeline carrying oil of specific gravity 0.9, flow being upward. The difference in elevation of the throat section and entrance section of the venturimeter is 300mm. The differential U- tube mercury manometer shows a gauge deflection of 250mm.Calculate:
a) The discharge of oil, and
b) The pressure difference between the entrance section and the throat section.
Take the co-efficient of meter as 0.98 and specific gravity of mercury as 13.6. [5+5]

OR

7. Discuss in detail the classification of orifices and notches. [10]

8. Define the following terms:
a) Laminar boundary layer
b) Turbulent boundary layer
c) Laminar sub layer
d) Boundary layer thickness. [10]

OR

9. How will you determine whether a boundary layer flow is attached flow, detached flow or on the verge of separation? [10]

10. Derive formulae for calculating loss of head due to:
a) Sudden enlargement and
b) Sudden contraction [5+5]

OR

11. Explain briefly the following with the help of a neat sketch:
a) Hydraulic gradient line (H.G.L)
b) Energy gradient line (E.G.L). [5+5]

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R15

Code No: 123BK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December-2016
FLUID MECHANICS
(Common to CE, CEE)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART - A **(25 Marks)**

1.a) What is vapour pressure? Explain. [2]
b) List out different fluid properties along with their significance. [3]
c) What do you mean by 1-D,2-D,and 3-D flows? [2]
d) Distinguish fluid Statics, Kinematics and Dynamics. [3]
e) Distinguish between notch and weir. [2]
f) Explain about Navier-Stokes equation. [3]
g) What is Vonkarman momentum integral? [2]
h) Explain about boundary layer in transition. [3]
i) Explain Reynolds number. [2]
j) Compare velocity profiles for laminar and turbulent flow in pipes. [3]

PART - B **(50 Marks)**

2.a) Enunciate Newton's law of viscosity. Explain the importance of viscosity in fluid motion. What is the effect of temperature on viscosity of water and that of air?
b) An oil of viscosity 5 poise is used for lubrication between a shaft and sleeve. The diameter of shaft is 0.5 m and it rotates at 200 rpm. Calculate the power lost in the oil for a sleeve length of 100 mm. The thickness of the oil film is 1.0 mm. [5+5]

OR

3.a) Derive an expression for the depth of centre of pressure of an inclined surface immersed in a liquid.
b) Find the total pressure and the centre of pressure on a vertical gate of the size 4 m × 6 m with 4 m edge coincides with the water surface. Assume one side of gate is filled with water, while on the other side of air. [5+5]

4.a) Define the following:
i) Steady flow,
ii) Non-uniform flow,
iii) Laminar flow, and
iv) Two-dimensional flow.
b) The water is flowing through a taper pipe of length 50 m having diameters 40 cm at the upper end and 20 cm at the lower end, at the rate of 60 litres/s. The pipe has a slope of 1 in 40. Find the pressure at the lower end if the pressure at the higher level is 24.525 N/cm^2. [5+5]

OR

5.a) Define stream line, path line and streak line. Derive mathematical expressions for each of these lines.

b) A 75 cm diameter uniform pipe bend turns the directions of flow of gasoline of sp.gr. 0.79 through an angle of 120^0 in the horizontal plane. The constant pressure and velocity through the bend are 90 KPa and 3 m/s respectively. Find the magnitude and direction of the force to be exerted on the bend to achieve the directional change. [5+5]

6.a) Integrate three-dimensional Euler's equations for steady flow condition and prove that each one of them yields Bernoulli's equation.

b) A pipe of diameter 200 mm. conveys a discharge of 2250 litres of water per minute and has a pressure of 15.70 kPa at a certain section. Find the total energy head with respect to a datum of 5 m below the pipe. [5+5]

OR

7.a) Differentiate between:
i) Bernoullis equation and Eulers equation
ii)Velocity head and Pressure head
iii) Energy equation and momentum equation.

b) The centre line of a pipe conveying water is horizontal. The sectional areas at sections 1-1 and 2-2 are 5 m^2 and 2 m^2 respectively. The pressure intensity and velocity at section 1-1 are 39.25 kPa and 1.2 m/sec respectively. Calculate the velocity and pressure at section 2-2. Ignore losses. [5+5]

8.a) What conditions should be satisfied for separation of boundary layer? Discuss briefly the methods that can be used to prevent separation.

b) How will you determine whether a boundary layer flow is attached flow or detached flow or on the verge of separation? [5+5]

OR

9.a) Describe pressure drag and friction drag.

b) What is meant by boundary layer? Explain with a neat sketch, development of boundary layer along a flat plate held parallel to uniform flow. Point out the salient features. [2+8]

10.a) Show that the loss of head due to sudden expansion in pipe line is a function of velocity head.

b) The rate of flow of water through a horizontal pipe is 0.3 m^3/s. The diameter of the pipe is suddenly enlarged from 250 mm to 500 mm. The pressure intensity in the smaller pipe is 13.734 N/cm^2. Determine: (i) loss of head due to sudden enlargement, (ii) pressure intensity in the large pipe and (iii) power lost due to enlargement. [5+5]

OR

11.a) Explain the terms: (i) Pipes in parallel (ii) Equivalent pipe and (iii) Equivalent size of the pipe.

b) Three pipes of lengths 800 m, 600 m and 300 m and of diameter 400 mm, 300 mm and 200 mm respectively are connected in series. The ends of the compound pipe is connected to two tanks, whose water surface levels are maintained at a difference of 15 m. Determine the rate of flow of water through the pipes if f = 0.005. What will be diameter of a single pipe of length 1700 m and f = 0.005, which replaces the three pipes. [5+5]

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Code No: 113BK

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November - 2015
FLUID MECHANICS
(Common to CE, CEE)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A **(25 Marks)**

1.a) What is Pascal's law? Explain. [2M]
b) List out different fluid properties along with their significance. [3M]
c) What do you mean by rotational and irrotational flows? [2M]
d) Distinguish between fluid Kinematics and Fluid Dynamics. [3M]
e) Distinguish between Orifice meter and venture meter. [2M]
f) What is broad crested Weir? [3M]
g) Explain the Magnus effect. [2M]
h) What is Prandtl contribution? [3M]
i) How do you distinguish laminar and turbulent flows? [2M]
j) What is Reynold's number? What is its significance? [3M]

PART-B **(50 Marks)**

2.a) Distinguish between:
i) Standard and local Atmospheric pressures
ii) Barometric pressure and Absolute pressure and
iii) Absolute pressure and Gauge pressure.
b) Derive an equation for hydrostatic force on inclined plane. [5+5]

OR

3.a) Define Viscosity, Surface tension and Vapor Pressure and explain their influence on fluid motion.
b) An open tank contains water up to a depth of 1.5 m and above it an oil of sp.gr.0.8 for a depth of 2 m. Find the pressure intensity:
i) at the interface of the two liquids, and
ii) at the bottom of the tank. [5+5]

4.a) Describe stream line, streak line and path line.
b) The water is flowing through a pipe having diameters 20cm and 15 cm at sections 1 and 2 respectively. The rate of flow through pipe is 40 litres/s. The section 1 is 9 m above datum line and section 2 is 5 m above the datum. If the pressure at section 1 is 32.40 N/cm^2, find the intensity of pressure at section 2. [5+5]

OR

5.a) What is the difference between stream function and velocity potential function?
b) Describe Eularian and Lagrangian approaches. [5+5]

6.a) Describe different types of notches with neat sketches.

b) A 22cm diameter pipe carries water under a head of 10 metres with a velocity of 7m/s. If the axis of the pipe turns through 45°, find the magnitude and direction of the resultant force at the bend. [5+5]

OR

7.a) State and derive the Bernoulli equation as an energy equation, mentioning clearly the assumptions made in the derivation. What are its limitations?

b) A 50^0 reducing elbow having an inlet diameter 25 cm and outlet diameter 15cm is fitted in a horizontal pipe line. If the rate of flow through the pipe is 150 litres/second, and inlet pressure is 1.00kg/cm^2, find the components of the forces necessary to hold the bend in position. Also find the resultant force and the direction in which it acts. [5+5]

8.a) What conditions should be satisfied for separation of boundary layer? Discuss briefly the methods that can be used to prevent separation.

b) How will you determine whether a boundary layer flow is attached flow or detached flow or on the verge of separation? [5+5]

OR

9.a) With a neat sketch, analyze the flow around submerged body.

b) What do you mean by boundary layer separation? What is the effect of pressure gradient on boundary layer separation? [5+5]

10.a) What do you understand by 'minor and major losses' in pipes? Explain them in brief.

b) Derive an expression for head loss due to friction. [5+5]

OR

11.a) Derive an expression from the fundamentals for the loss of head at a sudden contraction in a pipe line.

b) The rate of flow of water through a horizontal pipe is 0.2 m^3/s. The diameter of the pipe is suddenly enlarged from 200 mm to 400 mm. The pressure intensity in the smaller pipe is 12.5 N/cm^2. Determine:

i) loss of head due to sudden enlargement

ii) pressure intensity in the large pipe and

iii) power lost due to enlargement. [5+5]

---ooOoo---