

KADI SARVA VISHWAVIDYALAYA

B.E. III Sem Examination (Dec-2015)

SUBJECT CODE : CV 303

SUBJECT NAME: FLUID MECHANICS

DATE: 03/12/2015

TIME: 10.30 A.M TO 1.30 P.M

TOTAL MARKS : 70

Instruction: (1) Answer each section in separate answer sheet.

(2) Use of Scientific calculator is permitted.

(3) Assume the data if it is required.

SECTION-I

Q.1 A. Define the term : 5

Cohesion , Adhesion , Surface Tension, Ideal Fluid, Compressibility

B. State and prove Pascal's Law. 5

C. A wooden block floats in water with 5 cm height projecting above the water surface. If the same block is launched in glycerin (sp.gr is 1.35) projects 7.5 cm above the surface of glycerin. What is height of block and its relative density? 5

OR

C. The velocity distribution for flow over a plate is gives by $u = 2y - y^2$, where u is the velocity in m/s at a distance y meter above the plate. Determine the velocity gradient and shear stress at the boundary and 1.5 m from it. 5

Q.2 A. Explain..... Hydrostatic Paradox and Piezometer. 5

B. A circular plate 4 m external diameter and 2 m internal diameter is immersed in water in such a way that its greatest and least depths below water surface are as 4 m and 1 m respectively. Compute the total pressure and position of centre of pressure on one face of plate. 5

OR

A. Differentiate between simple manometer and differential manometer. 5

B. A rectangular wooden block of 2 m width, 1.5 m deep, 5 m long floats horizontally in water. Find the volume of water displaced and position of centre of buoyancy for this section. The density of wooden block is 650 Kg/m^3 . 5

Q.3 A. Explain velocity potential function and stream function. Show that streamlines and equipotential lines intersect orthogonally. 5

B. The velocity potential function is given by $\phi = 5 (x^2 - y^2)$. Calculate the velocity components at the point (4,5). 5

OR

- A. Derive the continuity equation of three dimensional flow. 5
- B. The velocity components are given and from that determine third component of velocity 5
such that they satisfy the continuity equation . $v = 2y^2$ and $w = 2xyz$.

SECTION – II

- Q.4 A. What are the various forces consider to derive Euler's equation ? 5
- B. State Bernoulli's theorem. List out its engineering applications. 5
- C. A horizontal venturimeter 16 cm x 8 cm is used to measure the flow of an oil of sp.gr. is 0.8 Determine the deflection of the oil mercury manometer , if the discharge of the oil is 60 lit/sec. Take $C_d = 1$. 5

OR

- C. The water is flowing through a pipe having diameters 30 cm and 12 cm at section A and B respectively. The rate of flow through pipe is 40 litres/second. The section A is 8 m above datum and section B is 6 m above datum. If the pressure at section A is 42 N/cm^2 , find the intensity of pressure at section B. 5
- Q.5 A. Explain the terms..... Hydraulic grade line , Total Energy line , Equivalent line. 5
- B. The head of water over an orifice of diameter 30 mm is 9 m. Find the actual discharge and actual velocity of the jet at vena contracta. Take $C_d = 0.62$ and $C_v = 0.98$. 5

OR

- A. What are the major losses and minor losses in pipe flow? Discuss them. 5
- B. Calculate the discharge through a rectangular orifice 2 m wide and 1.6 m deep fitted to a water tank. The water level in the tank is 2.7 m above the top edge of the orifice. Take coefficient of discharge = 0.62 5
- Q.6 A. Prove that the discharge through a triangle notch or weir is given by 5

$$Q = \frac{8}{15} C_d \cdot \tan\theta/2 \sqrt{2g}$$

- B. Water flows over a rectangular weir 1 m wide at a depth of 150 mm and afterward passes through a triangular right angled weir. Taking $C_d =$ for the rectangular and triangular weir as 0.62 and 0.59 respectively. Find the depth over the triangular weir. 5

OR

- A. Explain the different Hydraulic co efficient for orifice. 5
- B. Differentiate between V-notch and Rectangular notch. 5

***** ALL THE BEST *****

KADI SARVA VISHWAVIDHYALAYA

B.E. Semester-III Civil Engineering.

Subject Code:-CV 303

Subject name:-FLUID MECHANICS

Date:-27/11/2013

Time:- 10:00 am TO 1:00 pm

Total Marks:-70

Instruction:

1. Answer each section in separate Answer sheet.
2. Use of Scientific Calculator is permitted.
3. All questions are **Compulsory**.
4. Indicate **Clearly**, the options you attempt along with its respective question number.
5. Use the last page of main supplementary for **rough work**.

Section-I

Q-1 (All compulsory)

- (A) Define following [5]
(i) Density (ii) Capillary (iii) Viscosity (iv) Surface tension (v) Specific weight
- (B) The pressure inside a soap bubble of 50mm diameter is 2.5 N/m^2 above atmosphere estimate the surface tension of the soap film. [5]
- (C) State & Prove Pascal's law with usual notations. [5]
- OR
- (C) 2 liter of petrol weight 14N. Calculate the specific weight, mass density, specific volume and specific gravity of petrol with respect to water. [5]

Q-2 Answer the following Questions.

- (A) Derive expression for total pressure & center of pressure for a vertically immersed surface [5]
- (B) A circular plate 1.5m in diameter is immersed in the water. Its greatest & least depths below the surface are 1.80m & 0.9m respectively Calculate the pressure on one face of the plate & the position of the center of pressure [5]
- OR
- (A) Define manometer. List different types of manometers. Explain single column manometer with usual notation. [5]
- (B) Define the followings (i) Atmospheric pressure (ii) Gauge Pressure (iii) Vacuum pressure (iv) Absolute pressure [5]

Q-3 Answer the following Questions.

- (A) State the Bernoulli's equation & obtain Bernoulli's equation from Euler's equation of motion. [5]
- (B) A pipe through which water is flowing is having diameter 25cm & 15cm at the cross-sections 1 & 2 respectively. The velocity of water at section 1 is given by 4.5 m/s Find the velocity head at section 1 & 2 & also rate of discharge. [5]

OR

- (A) Explain briefly the following types of equilibriums of floating bodies. [5]
(i) Stable equilibrium (ii) Unstable equilibrium (iii) Neutral.
- (B) Explain flow net in details. Also discuss its characteristics utility & limitations. [5]

Section-II

Q-4 (All compulsory)

- (A) Explain & draw in detail total Energy line & Hydraulic gradient line. [5]
- (B) Explain the following terms: [5]
(i) Steady flow (ii) Unsteady flow (iii) Uniform flow (iv) Non-uniform flow & (v) Incompressible flow
- (C) A piping system consist of three pipes arranged in series, the length of the pipes are 1100m, 700m & 600m & diameter 700mm, 550mm & 450mm respectively (i) Transform the system to an equivalent 450mm diameter (ii) Determine an equivalent diameter for the pipe, 2500m long. [5]

OR

- (C) Define metacenter & metacentric height. Explain method for determination of metacentric height. [5]

Q-5 Answer the following Questions.

- (A) Derive an equation for discharge over a rectangular notch. [5]
- (B) An oil of viscosity 0.4 stoke is flowing through a pipe of 25cm diameter at a rate of 300 lit/sec. Find the head loss due to friction for the pipe length of 55m. [5]

OR

- (A) Classify different types of orifices according to its shapes, size, discharge condition & shape of upstream edge. Explain all in brief. [5]
- (B) What are the major & minor losses in pipe flow? Discuss them [5]

Q-6 Answer the following Questions.

- (A) The stream function for a two-dimensional flow is given by $\psi = 2xy$, calculate the velocity at the point P (2, 3) find the velocity potential function. [5]
- (B) Derive Darcy weisbach equation obtain expression for loss of head due to friction in pipe flow. [5]

OR

- (A) Write short note on flow through pipes in series. [5]
- (B) Calculate the discharge through a rectangular orifice 2m wide & 16m deep fitted to a water tank. The water level in the tank is 2.7m above the top edge of the orifice. Take coefficient of discharge = 0.62 [5]

KADI SARVA VISHWAVIDYALAYA

B.E. III Sem Examination (NOV-2014)

SUBJECT CODE : CV 303

SUBJECT NAME: FLUID MECHANICS

DATE: 15/11/2014

TIME: 10.30 A.M TO 1.30 P.M

TOTAL MARKS : 70

- Instruction: (1) Answer each section in separate answer sheet.
(2) Use of Scientific calculator is permitted.
(3) Assume the data if it is required.

SECTION-I

- Q.1 A. What is Fluid Mechanics? What is its application? 5**
B. Define following terms: 5
(i) Atmospheric pressure (ii) Gauge pressure (iii) Vacuum pressure (iv) Absolute pressure.
C. If the surface tension at air water interface is 0.069 N/m, what is the pressure difference 5
between inside and outside of an air bubble of diameter 0.009 mm.

OR

- C. Determine the minimum size of glass tubing that can be used to measure water level, 5**
the capillary rise in the tube is not to exceed 0.3 mm. Take surface tension of water in contact with air as 0.0735 N/m.
Q.2 A. Explain analytical method for the determination of meta centric height. 5
B. A differential manometer connected at the two points A and B in a pipe containing an oil 5
of specific gravity of 0.9 shows a difference in mercury levels as 150 mm. Find the difference in pressures at the two points.

OR

- A. Derive the continuity equation of three dimensional flows. 5**
B. An isosceles triangular plate of base 3 m and altitude 3m is immersed vertically in an oil 5
of specific gravity 0.8 and the base of the plate coincides with the free surface of oil. Determine (1) Total pressure on the plate (2) Centre of pressure.
Q.3 A. What is Flow net? What are the uses of flow net? 5
B. A rectangular pontoon is 4 m long, 3 m wide and 1.2 m high. The depth of immersion of 5
pontoon is 0.8 m in sea water having density 1025 kg/m^3 . Determine the metacentric height, if the centre of gravity is 0.6 m above the bottom of pontoon. Is the pontoon is stable equilibrium?

OR

- A. Write in details....Path line, Stream line, Potential line. 5
- B. In a flow velocity vector is given by $V = 3xi + 4yj - 7zk$. Determine the equation of stream line passing through a point $M = (1, 4, 5)$. 5

SECTION – II

- Q.4 A. Derive an expression for rate of flow through venturimeter. 5
- B. Derive Chezy's formula $V = C \sqrt{mi}$. 5
- C. For a velocity potential function $\Phi = 3xy$. Obtain the corresponding stream function. 5

OR

- C. A 20 cm X 10 cm venturimeter is used to measure the flow of oil with sp.gr. 0.8 . If the differential mercury manometer shows a deflection of 20 cm, find out the discharge of oil through pipe. Take $C = 0.92$ 5
- Q.5 A. What are the major losses and minor losses in pipe flow? Discuss them. 5
- B. A horizontal pipe 400 mm in diameter suddenly contracted to 200 mm diameter. The pressure intensities in the larger and smaller pipe is given as 12 N/cm^2 and 10 N/cm^2 respectively. If the rate of flow is $0.173 \text{ m}^3/\text{s}$. Find the coefficient of contraction C_c . 5

OR

- A. What are the hydraulic coefficients? Name them and derive the equation $C_c = C_d / C_v$. 5
- B. A vertical pipe tapers gradually from 60 mm diameter at top to 120 mm diameter at bottom in a length of 1.5 m. If it carries the discharge of 1500 lit/ minute, neglecting losses estimate pressure difference between two ends. 5
- Q.6 A. Prove that the discharge through a triangle notch or weir is given by 5
- $$Q = \frac{8}{15} C_d \cdot \tan\theta/2 \sqrt{2g}$$
- B. Find the diameter of a pipe of length 2000 m when the rate of flow through the pipe is 200 lit/sec and the head lost due to friction is 4 m. Take the value of $C = 50$ in chezy's formula. 5

OR

- A. Explain velocity potential and Stream functions. Show that streamlines and equipotential lines intersect orthogonally. 5
- B. Calculate the actual discharge and actual velocity of a jet at venacontracta considering the $C_d = 0.6$ and $C_v = 0.98$ for an orifice of 40 mm diameter, if the head over the orifice is 9 m. 5

***** ALL THE BEST *****

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