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FACULTY OF ENGINEERING AND TECHNOLOGY

S.E(Civil) Year Examination – MAY-2015

Fluid Mechanics -I

(Revised)

[Time: Three *Hours*] **[Max. Marks: 80]**

"Please check whether you have got the right question paper."

N.B i) Q.1 and Q.6 are compulsory.
ii) Attempt any two questions from each section from remaining.
iii) Draw neat sketches wherever necessary.
iv) Assume suitable data, if necessary.

SECTION -A

Q.1 Solve any five 10

a) Define Newton's Law of viscosity and give its expression.
b) What do you mean buoyancy?
c) Define stream line and streak line.
d) Define specific weight and mass density.
e) State and explain Pascal's law.
f) Define Kinematic viscosity.
g) What is principle of floatation.
h) Enlist different pressures.
i) Define Newtonian and Non-Newtonian fluids.
j) Give the equation for the depth of centre of pressure of an immersed surface from free Surface of the liquid.

Q.2 A) How would you determine the horizontal and vertical components of the resultant pressure on a sub-merged curved surface? 08

B) Determine the total pressure on a circular plate of diameter 1.5m which is placed vertically in water in such a way that center of plate is 2.0m below the free surface of water. Find the position of center of pressure also. 07

Q.3 A) Draw neat diagram of inverted U-tube differential monometer and an expression for pressure heads. 07

B) A solid cylinder 5.0m in diameter and 3.0m high is floating in water with its axis vertical. If it's specific gravity is 0.8, find the metacentric height .Also state whether the equilibrium is stable or unstable. 08

Q.4 A) Define stream function. Obtain an expression for stream function. 06

B) A viscous flow is taking place in a pipe of diameter 120mm. the maximum velocity is 2.5m/sec. find the mean velocity and the radius at which this occurs. Also calculate the velocity at 5cm from the wall of the pipe. 09

Q.5 A) Derive an expression for the metacentric height by an experimental method. 05

B) Define the laminal flow and turbulent flow and give one practical example for each. 05

C) What is a manometer? How are they classified? 05

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SECTION- B

Q.6 Solve any five. 10

a) What do you mean by large orifice?
b) Draw a neat diagram of bluff body.
c) Define velocity of approach.
d) Explain the impulse –momentum equation.
e) What do you mean by partially submerged notch?
f) Enlist the forces acting on fluid in motion.
g) Define boundary layer thickness.
h) Give the examples of the fluids flowing over stationary bodies in a stationary fluid
i) Give the formula for discharge over an ogee weir.
j) Enlist the practical applications of Bernoulli's equation.

Q.7 A) Determine the force exerted by a flowing liquid on a pipe bind by using impulse momentum equation. 07

B) A pipe, through which water is flowing, is having diameters 460mm and 230mm at the cross-section 1 and 2 respectively. The velocity of water at section 1 is given as 600cm/sec. find the velocity of water at section 2 and also rate of discharge. 08

Q.8 A) Define velocity of approach. Find an expression for the discharge over a rectangular weir with velocity of approach. 07

B) An ogee weir 4m long has a head of 50cm of water. If cd = 0.6, find the discharge over the weir. 08

Q.9 A) Obtain an expression for time of emptying a tank through an orifice at its bottom. 07

B) An external cylindrical mouth piece of diameter 200mm is discharging water under a constant head of 8.5m. if c_v = 0.62, cd = 0.855 and atmospheric head = 10.3m of water, find 08

i) discharge through the mouthpiece
ii) Absolute pressure head of water at venacontracta .

Q.10 Write notes on

i) Define displacement thickness. Derive an expression for the displacement thickness. 06
ii) General equations for lift and drag. 06
iii) Magnus effect. 03