KUMARAGURU
college of technology
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Register Number: ……

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2013)

Third Semester

CIVIL ENGINEERING

U13CET301: Fluid Mechanics

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. A real fluid possesses which of the following properties?
   a) Viscosity b) Surface Tension
   c) Compressibility d) Density
2. _____ is a property by which a liquid rises or lowers into thin glass tube above or below its general level.
3. Piezometer measures _____ pressure only.
   a) Absolute b) Gauge
   c) Atmosphere d) Hydrostatic
4. The term _____ means the study of pressure exerted by a fluid at rest.
5. If the flow is irrotational as well as steady it is known as
   a) Non uniform flow b) One dimensional flow
   c) Potential flow d) Laminar flow
6. The path followed by a fluid particle in motion is called as_____.
7. Velocity head is given by___.
   a) V/g b) $V^2/2g$
   c) $V^3/2g$ d) $V^3/2g^2$
8. In a turbulent flow Reynold's number is _____.
9. ____ is equal to the product of shear stress due to viscosity and surface area of flow.
   a) Viscous force b) Inertia force
   c) Pressure force d) Gravity force
10. ____ is the ratio of the square root of inertia force and gravity force.

PART B (10 x 2 = 20 Marks)

(Not more than 40 words)

11. What is meant by viscosity? Give its units.
12. Differentiate the term capillarity rise and capillarity fall.
13. What is meant by vacuum pressure?
14. Define the term center of pressure.
15. Classify the different types of fluid flow.
16. Define stream function.
17. List the assumptions made in the derivation of Bernoulli's equation.
18. Differentiate minor losses and major losses in a pipe network?
19. List out the different methods of dimensional analysis.
20. What is meant by undisturbed model?

PART C (5 x 14 = 70 Marks)

(Not more than 400 words)

Q.No. 21 is Compulsory

21. The velocity components in a two dimensional continuous flow are u = ax, v= by. Calculate the stream lines and sketch them.

22. a) To provide lateral stability for a long shaft of diameter 200 mm it is supported in a cylindrical bearing of diameter 200.20 mm. If the space between the bearing and the shaft is filled with a lubricant of viscosity 0.25 Ns/m^2, calculate the power required to overcome the viscous resistance when the shaft is rotated at 200 rpm. The bearing has a length of 250 mm.

(OR)

b) A cylindrical gate 2 m in diameter is kept on a floor in such a way that its longitudinal axis is horizontal. It has water on its both sides so that the depth of water on one side is 2 m whereas on the other side it is 1m. Calculate the magnitude and the direction of the resultant hydrostatic force exerted on the gate per meter length of the gate. Also calculate the minimum weight of the gate so that it will not float away from the floor.

23. a) A rectangular pontoon 12 meters long and 8 meters broad and 3 meters deep weighs 800 kN. It carries on its upper deck a boiler 5 meters diameter weighing

500 kN. The centre of gravity of the boiler and pontoon may be assumed at their centers of figure and on the same vertical line. Estimate the meta-centric height. Weight of sea water is 10055 N/m^3.

(OR)

b) The diameters at the ends of a 16 m long vertical conical pipe conveying water are 0.5 m and 1.5 m. The loss of head due to friction is 2.65m for flow in either direction when the velocity at the smaller section is 9 m/s. If the smaller section is at the top and the pressure head at this section is 2.15m of water, calculate the pressure head at the lower end when the flow is:

i) Downward 8)

ii) Upward. (6)

24. a) A tank of uniform cross-section has two orifices each of 50 mm diameter, in one of the vertical sides, provided at 2.4 m and 6 m above the bottom of the tank. Estimate the time required to lower the depth of water from 9 meters to 4.5 meters. The tank is $1m^2$ in area. Take C_d=0.62.

(OR)

b) A weir 36 meters long is divided into 12 equal bays by vertical posts, each 600 mm wide. Calculate the discharge over the weir if the head over the crest is 1.20 meter and the velocity of approach is 2 meters per second.

25. a) The efficiency η of a fan depends on the density ρ, the dynamic viscosity μ of the fluid, the angular velocity ω, diameter D of the rotar and the discharge Q. Evaluate η in terms of dimensionless parameters.

(OR)

b) The difference of water levels of two reservoirs is 8m. They are connected by a 40m long pipe. For the first 2.5 m length, the diameter of the pipe is 120 mm and for the remaining length the diameter is 200 mm, the change in diameter being sudden. Calculate the discharge into the lower reservoir. Take f=0.008.

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