

C 80677

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Name

Reg. No.



**FOURTH SEMESTER B.TECH. (ENGINEERING) [09 SCHEME]
DEGREE EXAMINATION, APRIL 2015**

CE 09 403 / PTCE 09 402 – FLUID MECHANICS

Time : Three Hours

Maximum : 70 Marks

Part A

Answer all questions.

1. What is meant by cavitation in pipes?
2. What is meant by buoyancy?
3. What is meant by free vortex and forced vortex.
4. Write Hagen Poisuille's equation.
5. State Mach's and Weber's law.

(5 × 2 = 10 marks)

Part B

Answer any four questions.

6. Write short notes on stream potential function and velocity potential function.
7. Define orifice and mouth piece. Explain them with neat sketches.
8. Derive the Darcy-Weisbach equation for friction head loss in a pipe.
9. The velocity distribution in a three-dimensional flow is given by $u = -x$, $v = 2y$ and $w = (3 - z)$. Find the equation of the stream line that passes through point (1, 1, 1).
10. The geometrical similar pumps are running at the same speed of 100 r.p.m. and lifting water against head of 25 m and 16 m respectively. The first pump is having impeller diameter of 300 mm. what is the impeller diameter of 2nd pump.
11. A sharp crested rectangular notch of 0.8 m width and a 90° V-notch are to be used alternatively for measuring an expected flow of 45 litres/sec of the liquid. Find the percentage error in discharge that would result in the two cases if an error 1 mm is made in the head measurement. Assume $C_d = 0.6$ for both the notches.

(4 × 5 = 20 marks)

Part C

Answer all questions.

12. Describe different types of manometers with neat sketches.

Or

Turn over

13. A rectangular plane surface 1 m wide and 3 m deep lies in such a way that the plane of the plate makes an angle of 30° with the free surface of water. Determine the total pressure and position of center of pressure when the upper edge of the plate is 2 m below the free water surface.
14. (i) Explain the characteristics of laminar and turbulent boundary layer.
 (ii) A spillway 7.2 m high and 150 m long discharges $2150 \text{ m}^3/\text{s}$ under a head of 4 m. If a 1 : 16 model of the spillway is to be constructed, find the model dimensions, head over the model and model discharge.

Or

15. Derive the expression for Buckingham's π theorem, with length L , diameter d , mean velocity V , viscosity of fluid μ .
16. The radial clearance between a hydraulic plunger and a cylindrical wall is 0.5 mm, the length of plunger is 300 mm and diameter is 100 mm. Find the velocity of leakage and rate of leakage past the plunger at an instant when the difference of pressure between the two exits of the plunger is gm of water. Take viscosity = 0.0727 poise.

Or

17. Assume the following velocity distribution in the circular plate.

$$U = u_{\max} (1 - y/R)^{1/7}. \text{ Calculate the}$$

- (i) Ratio of mean and maximum velocity.
 (ii) Radius at which actual velocity = Mean velocity.
18. A pipe line carrying oil of specific gravity 0.87 changes in diameter from 200 mm. diameter at a position A to 500 mm. Diameter at a position B which is 4 m at a higher level. If the pressures at A and B are 9.8 N/cm^2 and 5.886 N/cm^2 respectively and the discharge is 200 litres/sec., determine the loss of head and direction of flow.

Or

19. 250 l/s of water is flowing in a pipe having a diameter of 300 mm. If the pipe is bend by 135° , find the magnitude and direction of resultant force on the bend. The pressure of water flowing is 39.24 N/cm^2 .

(4 × 10 = 40 marks)