

GANPAT UNIVERSITY
B. Tech. Semester: III Civil Engineering
Regular Examination November – December- 2014
Subject: 2CI-305 Fluid Mechanics -I

Time: 3 Hours**Total Marks: 70**

- Instructions: (1) Answer to the two sections must be written in separate answer books.
 (2) Figures to the right indicate full marks.
 (3) Assume suitable data if required.

Section - I

- Que. – 1 (A)** A single column vertical manometer is connected to a pipe containing oil of sp.gravity 0.9. The area of the reservoir is 80 times area of the manometer tube. The reservoir contains mercury of sp. Gravity 13.6. The level of mercury in the reservoir is at a height of 30 cm below the center of the pipe and difference of mercury level in the reservoir and right limb is 50 cm. Find the pressure in the pipe. 06
- (B)** Define the following coefficients : (i) coefficient of velocity , (ii) coefficient of contraction and (iii) coefficient of discharge 06
- OR**
- Que. – 1 (A)** A simple manometer is used to measure the pressure of oil (sp. gravity=0.8) flowing in a pipe line. Its right limb is open to atmosphere and left limb is connected to the pipe. The centre of the pipe is 9cm below the level of mercury (sp.gravity 13.65) in the right limb. If the difference of mercury level in the two limbs is 15 cm, determine the absolute pressure of the oil in pipe. 06
- (B)** Enlist types of Manometer and Explain any one in detail with neat sketch. 06
- Que. – 2 (A)** Determine the loss of head due to friction in pipes by using Darcy's formula and Chazy's formula 06
- (B)** A horizontal pipe 50 m long is connected to a water tank at one end and discharge freely in to the atmosphere at the other end for the first 30 m of its length from the tank, the pipe is 200 mm diameter and its diameter suddenly enlarged to 400 mm. The height of the water level in the tank is 10 m above the centre of the pipe. Draw the hydraulic gradient line and total energy line. (Take $f= 0.01$ for both sides) 05
- OR**
- Que. – 2 (A)** Define Orifice and Derive equations for finding out discharge through Fully Submerged orifice. 06
- (B)** The head of water over an orifice of diameter 110 mm is 8 m. The water coming out from orifice is collected in a circular tank of diameter 2.1 m. The rise water level in circular tank is 1 m in 30 seconds. Also the co-ordinates of certain on the jet, measured from vena-contracta are 4.5 m horizontal and 0.2 cm vertical. Find the hydraulic coefficients C_d , C_v and C_c . 05

- Que. - 3 (A) Define Cipolletti weir and derive equation for finding out discharge through it. 04
- (B) A rectangular channel 1.5 m wide has a discharge of 200 lit/sec, which is measured by a right angled V-notch weir. Find the position of the apex of the notch from the bed of the channel if maximum depth of water is not to exceed 1m. Take $C_d=0.62$ 04
- (C) What do you understand by the term major energy loss and minor energy loss in pipes? 04

Section - II

- Que. - 4 (A) Derive the Continuity equation in Cartesian co-ordinates. 06
- (B) A wooden cylinder of length L and diameter L/2 is floating on water with its axis vertical. Find the meta centric height if the specific gravity of wood is 0.6. 06

OR

- Que. - 4 (A) Derive Euler's equation of motion. 06
- (B) A vertical gate of 5 m height and 3 m wide closes a tunnel running full with water. The pressure at the bottom of the gate is 195 kN/m^2 . Determine the total pressure on the gate and position of the centre of the pressure. 06

- Que. - 5 (A) Derive an expression for the force exerted on a submerged vertical and horizontal plane surface by the static liquid and locates the position of center of pressure. 06
- (B) A trapezoidal plate measuring 2m at top edge and 3m at the bottom edge is immersed in water with the plan making an angle of 30° to the free surface of water. The top and the bottom edges lie at 1m and 2m respectively from the surface. Determine the hydrostatic force on the plate. 05

OR

- Que. - 5 (A) Derive an expression for the Meta centric height of a floating body analytically. 06
- (B) A 5cm diameter nozzle is attached to pipe of 12cm diameter at its discharge end. The rate of discharge of water through the nozzle is 15lits/s and pressure at the base of the nozzle is 1.6bar. In the discharge end, the pressure is atmospheric. Calculate the coefficient of discharge for the nozzle. Assume that the base of the nozzle and the outlet of the nozzle are at same elevation. 05

- Que. - 6 (A) What is the difference between dynamic viscosity and kinematic Viscosity? How does viscosity of fluid vary with temperature? 04
- (B) Explain the term capillarity and derive the equation for capillary rise and capillary fall. 04
- (C) A metallic body floats at the interface of mercury of specific gravity 13.6 and water in such a way that 30% of its volume is submerged in mercury and 70% in water. Find the density of the metallic body. 04

END OF PAPER