JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech-IV/VI/VIII Semester (CSE/IT/ECE/CE)

COURSE CODE(CREDITS):18B11CE412 (3) MAX. MARKS: 35

COURSE NAME: Fluid Mechanics

COURSE INSTRUCTORS: Ashish Kumar MAX. TIME: 2 Hours

Note: (a)All questions are compulsory.

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

---

Q1. **(a)** briefly explain the concept of meta centre and metacentric height of a floating body with neat sketch. [CO 1] [2]

(b) A rectangular wooden box is 5 m long, 3 m wide and 1.2 m in height. The depth of immersion of box is 0.8 m in sea water. If centre of gravity is 0.6 m above the bottom of box, determine the metacentric height. Take density of sea water as 1025 kg/m^3. [CO 6] [3]

Q2. A man weighing 90 kgf descends to the ground from an airplane with the help of a parachute against the resistance of air. The velocity with which the parachute, which is hemispherical in shape, comes down is 20 m/s. find the diameter of the parachute. Assume $C_d = 0.5$ and the density of air 1.25 kg/m^3. [CO2, CO6] [5]

Q3. The drag force F working on smooth sphere of diameter D, moving with a uniform velocity V in a fluid of density ρ and dynamic viscosity μ. Develop the functional relationship between force F and other parameters. [CO5]

Q4. **(a)** Explain HGL and TEL with a neat sketch for a pipe flow system. [CO3] [5]

(b) Calculate the discharge through a pipe of diameter 200 mm when the loss of head between two ends of pipe 500 m apart is 4 m. Take coefficient of friction $f = 0.009$. [CO3] [3]

Q5. A flow equation is given by $\vec{V} = 2x^3 i + 3x^2 yj$. Is the flow steady or unsteady? Is the flow two or three dimensional? Make calculations for the velocity, local acceleration, and convective acceleration of a fluid particle in this flow field at point P (x,y,z) =(2,1,3). [CO 4] [5]

Q6. Two large plane surfaces are 3.0 cm apart. The space between the surfaces is filled with glycerine having dynamic viscosity = 8.1 x 10^{-1} N s/m^2. What force is required to drag a very thin plate of surface area 0.5 square metre between the two large plane surface at a speed of 0.6 m/sec if thin plate is in the middle of the two plane surface? [CO1] [5]

Q7. Determine the difference in the elevations between the water surfaces in the two tanks which are connected by a horizontal pipe of diameter 300 mm and length 400 m. The rate of flow of water through the pipe is 300l/s. consider all the losses and take $f = 0.008$. [CO6] [5]