Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B. TECH (IP ENGG.) MAKE UP EXAMINATIONS,

JUNE 2019

SUBJECT: FLUID MECHANICS AND MACHINERY [MME 2214]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.
- Draw neat labelled sketches wherever necessary.

1A. A U tube differential manometer connects two pressure pipes A & B. Pipe A contains carbon tetra chloride having specific gravity 1.594 under a pressure of 11.772N/cm^2 and pipe B contains oil of specific gravity 0.8 under a pressure of 11.772N/cm^2. The centre of pipe A lies 2.5m above centre of pipe B. Draw the arrangement and find the difference of pressure measured by mercury as manometric fluid. **4M**

1B. Explain the following: (i) vapor pressure and cavitation (ii) compressibility and bulk modulus. **3M**

1C. With a neat sketch derive expression for surface tension force in case of (i) soap bubble, (ii) liquid droplet and (iii) liquid jet. **3M**

2A. A circular plane surface of radius 2.5m, which has a concentric square hole of dimensions 1m lies vertically in water. Determine the total pressure and position of centre of pressure when the vertical outer diameter of plane surface is 2m below free surface of water. **4M**

2B. Explain any six types of fluid flow. **3M**

2C. Derive an analytical expression to determine the metacentric height of floating bodies. **3M**

3A. A 45^0 reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 40cm and 20cm respectively. Find the force exerted **4M**

by water on the bend (magnitude and direction) if the intensity of pressure at inlet of bend is 21.58N/cm^2. The rate of flow of water is 500litres/s.

3B. Explain the following: **3M**

(i) similarity and similitude.
(ii) Dimensional homogeneity.

3C. Derive Bernouli's equation starting from Euler's equation of motion. **3M**

4A. The efficiency of a fan depends on density ρ, dynamic viscosity μ, angular velocity ω, diameter D and discharge Q. Express efficiency in terms of dimensionless parameters. **4M**

4B. What are the minor head losses in case of flow through pipes? With neat sketches explain how they can be calculated (no derivation required). **3M**

4C. Derive Hagen Poiseuille equation for calculating the pressure loss in horizontal pipe flow with constant cross section. **3M**

5A. A jet of water of diameter 50 mm, having a velocity of 18 m/s strikes a curved vane which is moving with a velocity of 9 m/s in the direction of the jet. The jet leaves the vane at an angle of 65° to the direction of motion of vane at outlet. Determine: **4M**

(i) The force exerted by the jet on the vane in the direction of motion.

(ii) Work done per second by the jet.

5B. Explain the principle of working of pelton wheel. **3M**

5C. Derive an expression for force exerted when a jet strikes on curved plate on one end tangentially when the plate is unsymmetrical and moving. **3M**