Roll No. .....

3028

B. Tech. 3rd Semester (Civil Engg.) Examination – December, 2022

FLUID MECHANICS

Paper : PCC-CE-205-G

Time : Three Hours] *[Maximum Marks : 75*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt ***five*** questions in all, selecting at least ***one*** question from each Unit. Question No. 1 is ***compulsory***. All questions carry equal marks.

1. Explain the following : 2.5 × 6 = 15

(a) Vapour pressure and cavitations

(b) Absolute, Gauge and Vacuum Pressure

(c) Metacentric height of a floating body

(d) Stram line, Path line and Streak line

(e) Momentum and Energy thickness in Boundary Layer

(f) Venturimeter and Pitot tube

UNIT – I

2. What is surface tension ? Explain the phenomenon of surface tension with diagram. Derive an expression for surface tension in liquid droplet and hollow bubble. 15

3. Calculate the capillary effects in millimeters in a glass tube of 3.5 mm diameter, when immersed in (i) water and (ii) in mercury. The temperature of the liquid is 20°C and the values of surface tension of water and mercury at 20°C in contact with air are 0.0745 N/m and 0.45 N/m respectively. The contact angle of water $\theta = 0°$ and for mercury $\theta = 130°$. 15

UNIT – II

4. A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of sp. gr. 0.8 and having vacuum pressure is flowing. The other end of the manometer is open to atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 30 cm and the height of fluid in the left from the centre of pipe is 14 cm below. 15

5. Define Buoyancy and meta-centric height. Also describe experimental method of determination of the meta-centric height of a floating object. 15

UNIT – III

6. Define the equation of continuity. Obtain an expression for continuity equation for three dimensional flow. 15

7. Horizontal venture-meter with inlet diameter 25 cm and throat diameter 20 cm is used to measure the flow

of oil of sp. gr. 0.7. The discharge of oil through venture meter is 50 Lt/Sec. Find the reading of oil-mercury differential manometer take $C_d = 0.98$. 15

UNIT – IV

8. A flat plate was positioned at zero incidence in a uniform flow stream of air. Assuming boundary layer to be turbulent over the entire plate, workout the ratio skinfriction drag forced on the front and rear half part of the plate. 15

9. What are the different types of forces acting in moving fluid. Describe various dimensionless numbers in detail. 15
