Total No. of Questions – [8] Total No. of Printed Pages: 2

G.R. No.	

Paper code – U229-154 (BE - F & FS)

DECEMBER 2019/ENDSEM – Backlog Exam

S. Y. B. TECH. (MECHANICAL) (SEMESTER - I)

COURSE NAME: FLUID MECHANICS

COURSE CODE: MEUA22174

(PATTERN 2017)

Time: [**2 Hours**] [Max. Marks: **50**]

(*) Instructions to candidates:

1) **Answer Q.1, Q.2, Q.3, Q.4, Q.5 OR Q.6, Q.7 OR Q.8**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data whereever required**

Q.1) a) Differentiate Newtonian and Non-Newtonian fluids with the help of examples. [6]

OR

b) Show that center of pressure is always below the center of gravity for inclined plane surface immersed in static liquid. [6]

Q.2) a) The velocity components in a three dimensional incompressible flow is given by, [6]
$u = x^3 - y^3 - z^2x$, $v = y^3 - z^3$, $w = -3x^2z - 3y^2z + z^3 / 3$
Determine whether the flow satisfies continuity equation in three dimensions.

OR

b) For a two dimensional potential flow, the velocity potential function $\emptyset = x(2y - 1)$. [6]
Find the whether the flow is possible and expression for the stream function.

Q.3) a) Explain with the help of neat sketch the working of Pitot tube and also derive an expression of velocity for it. [6]

OR

b) Derive an expression of flow rate over triangular notch and list any two advantages of triangular notch over rectangular notch. [6]

Q.4) a) A 150 mm diameter pipe carries liquid in laminar region. A pitot tube is placed in the flow at a radial distance of 15 mm from axis of the pipe indicates a velocity of 0.5 m/s. Calculate the mean and maximum velocity of liquid in a pipe. [4]

OR

b) Two parallel plates kept 100 mm apart have a laminar flow between them and maximum velocity is 1.5 m/s. Calculate average velocity and discharge per meter width of the plate. [4]

Q.5) a) Derive Dupuit's equation for equivalent pipe. [6]

b) A 60 mm diameter pipe has a discharge of 450 LPM. At a section, the pipe has sudden expansion to a size of 90 mm diameter. Determine the head loss due to sudden expansion. [4]

c) Write a short note on compound pipe. [4]

OR

Q.6) a) Two reservoirs having a difference of elevation of 15 m are connected by a 200 mm syphon. The length of syphon is 400 m and summit is 3 m above the water level in the upper reservoir. The length of pipe from upper reservoir to summit is 120 m. If the coefficient of friction is 0.02, Determine discharge through syphon and pressure at the summit. Neglect minor losses. [6]

b) List any four minor losses with mathematical equations. [4]

c) Two reservoirs are connected by three pipes in parallel. Their diameters are d, 2d and 3d having same length and same frictional factor of pipes. Determine the discharge in larger pipes if discharge through smaller pipe (d1) is 2 m^3/s. [4]

Q.7) a) Explain the following : [6]

a) Boundary layer thickness

b) Displacement thickness

c) Momentum thickness

b) A plate 3 m × 1.5 m is held horizontally in water moving at 1.25 m/s parallel to its length. If the flow in the boundary layer is laminar at the leading edge of the plate, determine thickness of the boundary layer at this section. [4]

c) Explain any four methods of controlling separation of boundary layer. [4]

OR

Q.8) a) A man weighing 800 N descends to the ground from an aeroplane with the help of a parachute against the resistance of air. The shape of the parachute is hemispherical of 2.25 m diameter. Find the velocity of the parachute with which it comes down. Assume Cd = 0.5 and density of air = 1.223 kg/m^3. [6]

b) Differentiate between friction drag and pressure drag [4]

c) Why streamlined body is preferred for designing of modern cars. [4]