Total No. of Questions – [ 8 ]

Total No. of Printed Pages:3

| G.R. No. | |
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paper code: U228-154 (RE-ff)

**MAY 2019/ENDSEM** REEXAM

**S. Y. B. TECH. (MECHANICAL) (SEMESTER - II)**

**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) Explain the following with units and symbols [6]
i) Specific gravity
ii) Capillarity
iii) Vapor pressure

**OR**

b) State and prove Pascal's law. [6]

Q.2) a) The velocity components in two dimensional flow field is given by [6]

$u = \frac{y^3}{3} + 2x - x^2y$ , $v = xy^2 - 2y - \frac{x^3}{3}$

Determine whether the flow is possible?
Obtain an expression for velocity potential function.

**OR**

b) The velocity potential function is given by [6]

$\Phi = \frac{xy^3}{3} - x^2 + \frac{x^3y}{3} + y^2$

Calculate the velocity components in x and y direction.
Check possibility of flow.

Q.3) a) An Orifice of diameter 12 cm is inserted in a pipe of 24 cm diameter. The end pressure guage fitted upstream and downstream of the orifice meter gives reading of 29.43 $N/cm^2$ and 14.72 $N/cm^2$ respectively. Coefficient of discharge of orifice-meter is 0.6. Estimate the flow rate of water through pipe. [6]

**OR**

b) A pump is pumping water at the of 7536 LPM. The pump inlet is 40 cm in diameter and vacuum pressure over there is 15 cm of mercury. The pump outlet is 20 cm in diameter and it is 1.2 m above the inlet. The pressure at the outlet is 107.4 $kN/m^2$. Estimate the head loss between inlet and outlet of the pump. Neglect energy added by the pump. [6]

Q.4) a) Show that for a steady laminar flow through a circular pipe mean velocity of flow occurs at a radial distance of 0.707R from center of the pipe where R is radius of pipe. [4]

**OR**

b) Explain the following dimensionless numbers [4]
i) Weber's number
ii) Froude's number

Q.5) a) Derive an expression for loss of head due to friction. [6]

b) A Piping system consists of three pipes arranged in series. The lengths of the pipes are 1200 m, 750 m and 600 m and diameters 750 mm, 600 mm and 450 mm respectively. Determine an equivalent diameter of the pipe. [4]

c) Define Hydraulic gradient line (H.G.L) and Total energy line (T.E.L) [4]

**OR**

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

b) Differentiate between compound pipe and parallel pipe. [4]

c) Write a short-note on Moody's chart. [4]

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

a) Energy thickness

b) Displacement thickness

c) Momentum thickness

b) A smooth flat plate 2 m wide and 2.5 m length is towed in oil of specific gravity = 0.8 at a velocity of 1.5 m/s along its length. Find the thickness of boundary layer and power required to towing the plate. The kinematic viscosity of oil is $10^{-4}$ $m^2/s$. [4]

c) Differentiate between streamlined body and bluff body. [4]

**OR**

Q.8) a) Experiments were conducted in a wind tunnel with a speed of 50 km/hr on flat plate of size 2 m long and 1 m wide. The density of air is 1.15 $kg/m^3$. The coefficients of lift and drag are 0.75 and 0.15 respectively. Determine the lift force, drag force, the resultant force, direction of resultant force and power exerted by air on the plate. [6]

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

c) Differentiate between friction drag and pressure drag. [4]