Sub Code:NCE301

Paper Id: 100305 Roll No:

B.TECH
(SEM-III) THEORY EXAMINATION 2019-20
FLUID MECHANICS

Time: 3 Hours *Total Marks: 100*

Note: Attempt all Sections. If required any missing data, then choose suitably.

SECTION A

1. Attempt all questions in brief. **2 x 10 = 20**

a.	What is a continuum?
b.	What are manometers used for?
c.	State different types of fluid flows.
d.	What is Reynold's number?
e.	For what purpose Venturi meters are used?
f.	Enlist difference between model and prototype.
g.	What is laminar flow?
h.	Write formula of some of the minor losses in pipe flow
i.	What is difference between drag and lift?
j.	What is a compressible flow?

SECTION B

2. Attempt any *three* of the following: **10x3=30**

a.	Derive an expression for the depth of centre of pressure from free surface of a liquid of an inclined plane surface submerged into the liquid
b.	What is Euler number and Mach number. Explain their significance
c.	A venturimeter is to be fit in a 200-mm diameter horizontal pipe line. The inlet pressure is 100 kPa. If the maximum flow of oil (specific gravity=0.85) is 0.2 m^3/s, calculate the least diameter of the throat, so that thepressure does not fall below 250 mm mercury (vacuum). Assume that 3% of the differential head islost between the inlet and the throat.
d.	Two reservoirs are connected by a pipe which is 200 mm in diameter for the25 m length. The water surface in the upper reservoiris 7.5 m above that in the lower reservoir. Calculate the flow rate through pipe and drawHGL and TEL. Take friction factor as 0.02 for both the pipes.
e.	A hemi-spherical parachute of diameter 2.0 m is used for jumping from an airplane by the pilot weighing 700N. If the weight of the parachute is 200 N and C_D = 1.20, determine the velocity of parachute with which it comes down in standard air.

SECTION C

3. Attempt any *one* part of the following: **10x1=10**

a.	Derive an expression for the time period of oscillation of a floating body in terms of radius of gyration and meta-centric height of floating body.
b.	An open tank contains water up to depth of 2m and above it an oil of specific gravity 0.9 for a depth of 1m. Find the pressure intensity at the interface of two liquids and at the bottom tank.

Paper Id: 100305 Roll No: | | | | | | | | | | | | | |

4. Attempt any *one* part of the following: 10x1=10

a.	The pressure difference in a pipe of diameter D and length l due to turbulent flow dependsupon the velocity V, viscosity, density, and roughness k. Using Buckingham's pi theoremobtain an expression for pressure difference.
b.	In a flow field of a fluid, the velocity potential function is expressed by the following equation Velocity potential = 2xy -x Determine the value of steam function.

5. Attempt any *one* part of the following: 10x1=10

a.	A Venturimeter carries a liquid of relative density 0.8 and has inlet and throat diameters of160 mm and 80 mm respectively. If the actual rate of flow is 40 Lps and the C_D= 0.98, calculate the pressure difference betweenthe inlet and throat in kN/m^2.
b.	Draw a neat diagram of the following showing the flow lines and equipotential lines Source i) sink ii) doublet

6. Attempt any *one* part of the following: 10x1=10

a.	A horizontal pipe of diameter 200 mm is fitted to a tank containing oil of relativedensity0.90. At the end of pipe, a nozzle of diameter 20 mm is fitted. The head acting on thepipe is 4 m. Determine discharge from the nozzle and pressure at the base of nozzle.The energy loss in the pipe can be taken as 20 times the velocity head in pipe andneglecting energy loss in the nozzle.
b.	Find the head loss due to friction in a pipe if the discharge is .5 m^3/s and the diameter of the pipe is 0.2 m. the coefficient of friction is f =.005. find the head loss per unit length in the pipe flow. Assume flow to be laminar

7. Attempt any *one* part of the following: 10x1=10

a.	Compare the thickness of boundary layer formed on a flat plate at 0.5 m from the leading edge if the free stream velocity is 1.0 m/s and the fluid is air ($v = 2*10^{-5} m^2/s$) Is the boundary layer laminar or turbulent? Use Blasius equation.
b.	Explain Magnus effect with suitable example and neat diagrams.