



CBCS SCHEME

17MT42

## Fourth Semester B.E. Degree Examination, Jan./Feb. 2021 Fluid Mechanics and Machines

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

## Module-1

Define the following with Mathematical Equation:

i) Weight density ii) Newton law of viscosity iii) Surface Tension iv) Specific Gravity.

(08 Marks)

b. Calculate the dynamic viscosity of an oil, which is used for lubrication between a surface plate of size  $0.8 \times 0.8$ m and an inclined plane with angle of inclination 30° as shown in Fig Q1(b). The weight of the square plate is 300N and it slides down the inclined plane with a uniform velocity 0.3 m/sec. The thickness of oil film is 1.5mm.

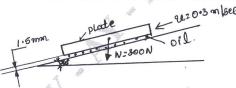


Fig Q1(b)

(05 Marks)

State and prove Pascal Law.

(07 Marks)

OR

State and prove Hydrostatic law.

(07 Marks)

Explain the following pressure with graph

i) Absolute pressure iii) Gauge pressure iii) Vaccum pressure iv) Atmospheric pressure.

Define Manometer, Classify. A right Limb of simple U-tube monometer containing mercury is open to Atmosphere while the left limb is connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The centre of the pipe is 12cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two Limbs is 20cm. (08 Marks)

Define the following fluid flow 3

i) Steady flow and unsteady flow

ii) Compressible flow and incompressible flow.

(04 Marks)

Derive an Equation for Three dimensional (3D) continuity equations.

(10 Marks)

Explain velocity potential and stream function.

(06 Marks)

## OR

With assumption derive an equation for Bernoulli's Equation of motion starting from Euler Equation of motion.

The water is flowing through a taper pipe of Length 100m having diameter 600mm at the upper end and 300mm at the lower end, at the rate of 50 ltr/sec. The pipe has a slope of 1 in 30. Find the pressure at the lower end if the pressure at higher level is 19.62N/cm<sup>2</sup>.

(06 Marks)

Write Limitation of Bernoulli's Equation.

(04 Marks)

Module-3 Define Dimensional homogeneity. (02 Marks) The frictional toque T of a disc of diameter D, rotating at a speed N in a fluid of viscosity  $\mu$ , and density  $\rho$ , in a turbulent flow is given by  $T = D^5 N^2 \rho \phi \left| \frac{\mu}{D^2 N \rho} \right|$  prove this by Buckingham's  $\pi$  theorem. (08 Marks) c. With mathematical formula define the following dimensionless Number i) Reynolds number ii) Froude number iii) Euler's number iv) Weber's number v) Mach's number. (10 Marks) OR Derive an Expression for venturimeter discharge equation with assumption made. (10 Marks) Derive an expression for the V notch discharge equation. (08 Marks) Write short note on pitot tube. (02 Marks) Module-4 Define turbo machine. With neat diagram, explain parts of turbo machine. (08 Marks) Write difference between Turbo machine and positive displacement machine. (08 Marks) Classify the turbo machine. (04 Marks) Derive an expression for Euler turbine Equation. (10 Marks) Derive an expression for Alternative form of Euler Equation. (10 Marks) Module-5 a. Derive an expression for Maximum blade efficiency of Pelton turbine. (10 Marks) With a neat sketch, explain working of Kaplan turbine. (07 Marks) Write the function of Draft tube. (03 Marks) a. Define Compounding? Explain pressure compounding with pressure velocity diagram. (07 Marks) Derive an Expression for Maximum blade efficiency of single stage impulse turbine. (10 Marks) Define the following: Blade efficiency  $(\eta_{blade})$ Axial thrust (F<sub>a</sub>) (03 Marks)

\* \* \* \* \*