



**BTECH**  
**(SEM III) THEORY EXAMINATION 2021-22**  
**FLUID MECHANICS & FLUID MACHINES**

**Time: 3 Hours****Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief. 2 x 10 = 20**

Q no.	Question	Marks	CO
a.	Define ideal fluid.	2	1
b.	Describe capillary rise.	2	1
c.	Define Froude's number.	2	2
d.	Describe the significance of Reynold's number.	2	2
e.	Explain eddy viscosity.	2	3
f.	Define laminar sub layer.	2	3
g.	Define unit power for a turbine.	2	4
h.	Explain the function of penstock in a hydroelectric power plant.	2	4
i.	Define a pump.	2	5
j.	Describe the slip of a reciprocating pump.	2	5

**SECTION B****2. Attempt any three of the following: 3 x 10 = 30**

Q no.	Question	Marks	CO
a.	A horizontal venturimeter with inlet diameter 200 mm and throat diameter 100 mm is employed to measure the flow of water. The reading of the connected differential manometer is 180 mm of mercury. Calculate the rate of flow if the co-efficient of discharge is 0.98.	10	1
b.	For a two-dimensional flow the velocity potential function is given by the expression, $\phi = x^2 - y^2$ . (i) Determine velocity components in x and y directions. (ii) Determine stream function.	10	2
c.	Derive the expression for energy thickness.	10	3
d.	Explain the governing of Pelton turbine with neat sketch.	10	4
e.	Explain the ideal indicator diagram. Describe the effect of friction in suction and delivery pipes on indicator diagram.	10	5

**SECTION C****3. Attempt any one part of the following: 1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Discuss the effect of increase in temperature on viscosity of fluids along with the logic.	10	1
b.	Illustrate the difference between notch and weir. During an experiment in a laboratory, 0.05 m <sup>3</sup> of water flowing over a right-angled notch was collected in 1 minute. If the head of the sill is 50 mm, calculate the co-efficient of discharge.	10	1



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**4. Attempt any one part of the following: 1 x 10 = 10**

Q no.	Question	Marks	CO
a.	The resistance $R$ experienced by a partially submerged body depends upon the velocity $V$ , length of the body $l$ , viscosity of the fluid $\mu$ , density of the fluid $\rho$ and gravitational acceleration $g$ . Using Buckingham's pi theorem, determine an expression for $R$ .	10	2
b.	Illustrate the derivation for continuity equation for three-dimensional flow.	10	2

**5. Attempt any one part of the following: 1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Illustrate: (i) Siphon (ii) Pipes in series (iii) Total energy line	10	3
b.	A kite 0.8 m X 0.8 m weighing 3.924 N assumes an angle of $12^\circ$ to the horizontal. The string attached to the kite makes an angle of $45^\circ$ to the horizontal. The pull on the string is 24.525 N when the wind is flowing at a speed of 30 km/hour. Calculate the corresponding co-efficient of drag and co-efficient of lift. Density of air is given as $1.25 \text{ kg/m}^3$ .	10	3

**6. Attempt any one part of the following: 1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Illustrate the derivation for the expressions of: (i) Unit discharge for a turbine (ii) Unit speed for a turbine	10	4
b.	A jet of water, 60 mm in diameter, strikes a curved plate at its center with a velocity of 18 m/s. The curved vane is moving with a velocity of 6 m/s in the direction of the jet. The jet is deflected through an angle of $165^\circ$ . Assuming the plate to be smooth, calculate: (i) Thrust on the plate in the direction of jet (ii) Power of the jet (iii) Efficiency of the jet	10	4

**7. Attempt any one part of the following: 1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Illustrate the derivation for the: (i) Specific speed of centrifugal pump (ii) Minimum speed for starting a centrifugal pump	10	5
b.	Illustrate the classification of reciprocating pump. Show that the work done by a reciprocating pump is proportional to the area of indicator diagram.	10	5