Subject Code: BME302

PAPER ID-311412

Roll No:

BTECH

(SEM III) THEORY EXAMINATION 2023-24

FLUID MECHANICS & FLUID MACHINES

TIME: 3HRS **M.MARKS: 70**

Note: 1. Attempt *all* Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief.

Q no.	Question	Marks	CO
a.	What is specific weight and specific gravity?	2	1
b.	Define the terms Cc, Cv in case of orifice meter.	2	1
c.	Differentiate between laminar and turbulent flow.	2	2
d.	Differentiate between rotational and irrotational flow.	2	2
e.	What is the expression of Reynold number?	2	3
f.	What is the Mechanical efficiency of a Pump?	2	4
g.	What is slip in case of reciprocating pump?	2	5

SECTION B

2. Attempt any *three* of the following:

a.	What is the use of venturimeter? Also derive the expression of discharge through venturimeter.	7	1
b.	Explain the principal of continuity equation. Also explain steady and unsteady flow.	7	2
c.	The velocity distribution in the boundary layer is given by $u/U = 2(y/\delta)-(y/\delta)^2$ Where, δ= boundary layer thickness. Calculate the following: Displacement thickness Momentum thickness	7	3
d.	Derive an expression for the work done per second by water on the runner of the Pelton wheel using velocity triangles and also find the expression for maximum efficiency.	7	4
e.	Explain the working of air vessel with neat diagram? What is the importance of the air vessel for reciprocating pump?	7	5

SECTION C

3. Attempt any *one* part of the following:

a.	Calculate the dynamic viscosity of oil, which is used for lubrication between a square plate of size 0.8m x 0.8m and an inclined plane with angle of inclination 30°. The weight of square plate is 300m and it slides down the inclined plane with a uniform velocity 0.3m/s. The thickness of the oil film is 1.5mm.	7	1
b.	Explain the concept of viscosity. Also explain the impact of temperature on viscosity.	7	1

4. Attempt any *one* part of the following:

a.	Water flows through a pipe AB 1.2 m diameter at 3m/s and then passes through a pipe BC 1.5m diameter. At C the pipe branches, Branch CD is 0.8 m in diameter and carries one third of the flow in AB. The flow velocity in branch CE is 2.5m/s. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE.	7	2
b.	Derive an expression for continuity equation in three dimensions for Cartesian	7	2

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	co-ordinate which is applicable for steady and incompressible		
5.	**Attempt any *one* part of the following:**		
a.	What do you mean by boundary layer separation? What is the effect of pressure gradient on boundary layer separation?	7	3
b.	Derive an expression of velocity distribution when water is flowing in a circular pipe.	7	3
6.	**Attempt any *one* part of the following:**		
a.	A reaction turbine works at 450 r.p.m under a head of 120m. Its diameter at inlet is 1.2m and the flow area is 0.4m². The angle made by absolute and relative velocities at inlet are 20° and 60° respectively with the tangential velocities. Determine: (i) The volume flow rate (ii) The power developed	7	4
b.	Explain the phenomenon of cavitation in case of turbine. Also write the method to avoid it.	7	4
7.	**Attempt any *one* part of the following:**		
a.	What are the difference between centrifugal pump and reciprocating pump?	7	5
b.	Draw an indicator diagram for reciprocating pump. Prove that work done by the pump is proportional to the area of the indicator diagram.	7	5