PAPER ID-311428

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM III) THEORY EXAMINATION 2023-24
FLUID MECHANICS & FLUID MACHINES

TIME: 3HRS **M.MARKS: 100**

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

SECTION A

1. Attempt *all* questions in brief.

Qno.	Question	Marks
a.	Describe Newton's law of viscosity in brief.	2
b.	Define surface tension.	2
c.	Define Reynold's number.	2
d.	Describe velocity potential function.	2
e.	Describe boundary layer thickness.	2
f.	Define energy thickness.	2
g.	Differentiate between impulse and reaction turbine.	2
h.	Explain unit speed of a turbine.	2
i.	Explain mechanical efficiency of centrifugal pump.	2
j.	Differentiate between single-acting and double-acting reciprocating pump.	2

SECTION B

2. Attempt any *three* of the following:

a.	Derive the expression for capillary rise. The capillary rise in the glass tube is not to exceed 0.2 mm of water. Determine its minimum size, given that surface tension for water in contact with air is = 0.0725N/m.	10
b.	Calculate on the basis of Buckingham's pi theorem suitable parameters to present the thrust developed by a propeller. Assume that the thrust P depends upon the angular velocity ω, Speed of advance V, diameter D, dynamic viscosity μ, mass density ρ, elasticity of the fluid medium which van be denoted by the speed of sound in the medium C.	10
c.	Derive the expression for momentum thickness.	10
d.	Explain the governing of Pelton turbine with neat sketch.	10
e.	Explain: (i) Priming of a centrifugal pump (ii) Cavitation in centrifugal pumps (iii) Manometric efficiency of a centrifugal pump	10

SECTION C

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

a.	Derive the expression to calculate the discharge through an orificemeter.	10
b.	Derive the expression to calculate the discharge over a rectangular notch.	10

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

a.	If for a two-dimensional potential flow, the velocity potential is given by $\phi=(2y-1)$. Determine the velocity at point P(4,5). Determine also the value of stream function at the point P.	10
b.	Illustrate: (i) Rotational and irrotational flow (ii) Sonic and supersonic flow	10

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	(iii) Stream function	

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

a.	Illustrate momentum correction factor and kinetic energy correction factor. Derive the expression for momentum correction factor for viscous flow through circular pipe.	10
b.	A syphon of diameter 200 mm connects two reservoirs having a difference in elevation of 20 m. The length of the syphon is 500 m and the summit is 3.0 m above the water level in the upper reservoir. The length of the pipe from upper reservoir to the summit is 100 m. Calculate the discharge through the syphon and also pressure at the summit. Neglect minor losses. The co-efficient of friction = 0.005.	10

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

a.	Illustrate the specific speed of a turbine. Derive an expression for specific speed.	10
b.	A reaction turbine works at 450 r.p.m. under a head of 120 metres. Its diameter at inlet is 120 cm and flow area is 0.4 m^2. The angles made by absolute and relative velocities at inlet are 20^0 and 60^0 respectively with the tangential velocity. Calculate: (i) The volume flow rate (ii) The power developed (iii) Hydraulic efficiency. Assume whirl at outlet to be zero.	10

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

a.	Illustrate main parts of a centrifugal pump with neat sketches. Illustrate different types of casings used in centrifugal pump.	10
b.	Illustrate indicator diagram. Prove that the area of indicator diagram is proportional to the work done by the reciprocating pump.	10