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BTECH
(SEM III) THEORY EXAMINATION 2024-25
FLUID MECHANICS & FLUID MACHINES

TIME: 3 HRS

M.MARKS: 100

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. Attempt all questions in brief.

2 x 10 = 20

Q no.	Question	CO	Level
a.	State the Newton's law of viscosity.	1	K2
b.	Define surface tension.	1	K2
c.	What is laminar flow and turbulent flow?	2	K2
d.	Write the rotation velocity components in a fluid flow.	2	K2
e.	Draw the graph of velocity distribution of a fluid flowing in a circular pipe.	3	K2
f.	What is boundary layer thickness?	3	K2
g.	What is reaction turbine?	4	K2
h.	What is the use of draft tube in a reaction turbine?	4	K2
i.	What will be the total % of work saved by fitting the air vessel? Explain.	5	K5
j.	Explain the any two important types of losses in the pump during operation.	5	K5

SECTION B

2. Attempt any three of the following:

10 x 3 = 30

Q no.	Question	CO	Level
a.	Explain the flowing; 1. Source flow and sink flow. 2. Notches and weirs. 3. Flow separation. 4. Cavitation. Hydrodynamic thrust.	1	K2
b.	Derive the continuity equation for a three-dimensional steady and incompressible fluid flow.	2	K2
c.	Explain the boundary layer formation with neat diagram for a uniform flow over a flat plate and also mention the various zone formations within the boundary layer.	3	K2
d.	Derive an expression for the force exerted by a jet of water striking tangentially at one tip of a moving curved vane in the direction of the jet.	4	K2
e.	Define specific speed of centrifugal pump and derive the expression for it.	5	K5

SECTION C

3. Attempt any one part of the following:

10 x 1 = 10

Q no.	Question	CO	Level
a.	Define the working Venturimeter. Derive the expression for rate of flow of fluid through Venturimeter.	1	K2



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b.	A pipeline conducts water from a reservoir to a power house, the elevation of which is 200 m lower than that of surface of reservoir. The water is discharged through a nozzle with a jet velocity of 60 m/s and at nozzle exit the jet has a diameter of 20 cm. Make calculation for the power of jet and the power lost in friction between the reservoir and jet.	1	K2
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4. Attempt any *one* part of the following:

10 x 1 = 10

Q no.	Question	CO	Level
a.	Prove that streamlines and equipotential lines meet each other orthogonally.	2	K2
b.	Define rotational and irrotational flow, uniform and non-uniform flow, compressible and incompressible flow with real life examples.	2	K2

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

10 x 1 = 10

Q no.	Question	CO	Level
a.	What is syphon and where is it used? Explain its action and how is it started?	3	K2
b.	Two pipes of 0.35 m and 0.25 m diameter and length 2000 m and 1500 m with f values 0.021 and 0.018 connected in series carry water from a reservoir to a supply system, the head available being 8 m. Determine the flow quantity neglecting minor losses.	3	K2

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

10 x 1 = 10

Q no.	Question	CO	Level
a.	Explain the working principle of Kaplan turbine along with its application	4	K2
b.	A Pelton turbine running at 720 rpm uses 300 kg of water per second. If the head available is 425 m determine the hydraulic efficiency. The bucket deflects the jet by 165° . Also find the diameter of the runner and jet. Assume $C_v = 0.97$ and $\phi = 0.46$, Blade velocity coefficient is 0.9.	4	K2

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

10 x 1 = 10

Q no.	Question	CO	Level
a.	What is an air vessel? Explain working of air vessel.	5	K5
b.	Compare the working principles, applications, advantages, and disadvantages of a centrifugal pump and a reciprocating pump.	5	K5