January 2023

B. Tech (ME/ME(HINDI)) 3rd SEMESTER

Fluid Mechanics and Machines (PCC-ME-303-21)

Time: 3 Hours   Max. Marks:75

Instructions: 1.   *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*

2.   *Answer any four questions from Part -B in detail.*

3.   *Different sub-parts of a question are to be attempted adjacent to each other.*

PART -A

Q1 (a)	Define specific gravity.	(1.5)
(b)	Write the conditions for stability of submerged body.	(1.5)
(c)	Draw neat sketch of venturimeter.	(1.5)
(d)	Name the various losses in pipes.	(1.5)
(e)	Define boundary layer thickness.	(1.5)
(f)	What is the need of dimensional analysis.	(1.5)
(g)	Define Similitude.	(1.5)
(h)	Draw velocity triangles for Francis turbine.	(1.5)
(i)	What is cavitation?	(1.5)
(j)	Define Manometric head.	(1.5)

PART -B

Q2 (a) Define metacenter. Determine the formula for the measurement of metacentric (07) height of a floating body.

(b) The space between two square flat parallel plates is filled with oil. Each side of (08) plate is 720mm. The thickness of the oil film is 15mm. The upper plate, which moves at 3m/s requires force of 120N to maintain the speed. Determine:
(i) dynamic viscosity of the oil (ii) kinematic viscosity of the oil if the specific gravity of the oil is 0.95

Q3 (a) Derive continuity equation. (07)

(b) A 30cm diameter horizontal pipe having maximum discharge 18m³/min. (08) Venturimeter is attached in a pipe line where pressure head is 5m of water. Determine minimum diameter of throat with condition that pressure head at throat cannot be negative. Take coefficient of discharge for meter as 1.

Q4 (a) Derive Von-Karman Integral momentum equation for boundary layer. (07)

(b) To supply water in a city a pipe of diameter 30cm is required, however pipes (08) having diameter more than 25cm are not available. Now the suggestion is to install two parallel pipes of same diameter. Find the diameter of these parallel pipes.

Q5 (a) Define Buckingham Pi theorem. Explain Buckingham Pi method. (07)
   (b) Discuss the various dimensionless numbers and also write their importance. (08)

Q6 (a) Discuss the governing mechanism of Pelton Turbine. (07)
   (b) A reaction turbine works at 450rpm under a head of 120m. Its diameter at (08) inlet is 1.2m and the flow area is 0.4m². The angle made by absolute and relative velocities at inlet are 20⁰ and 60⁰ respectively with the tangential velocity. Determine: (i) The volume flow rate (ii) The power developed and (iii) The hydraulic efficiency.

Q7 (a) What is the difference between pump and a turbine? Explain centrifugal pump (07) with the help of a diagram.
   (b) Explain simple indicator diagram of a reciprocating pump. Discuss the effect of (08) acceleration head on indicator diagram.

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