(Time: 3 hours)   Total marks: 80

N:B **(1)**Question no. 01 is compulsory.
(2) Attempt any 3 questions out of the remaining 5 questions.
(3) Assume data wherever necessary and clearly mention the assumption made.
(4) Draw neat figures as required.

Q1   Attempt Any Four   **20**
A   Define hydraulic efficiency, mechanical efficiency and overall efficiency of a Turbine.
B   Explain undistorted models. What is the use of undistorted models?
C   What is priming? Why is it necessary?
D   Derive the conditions for most economical circular channel section for maximum discharge.
E   Derive moment of momentum equation.
F   Compare between impulse turbine and reaction turbine.

Q2   **A**   Derive on the basis of dimensional analysis suitable parameters to present the thrust developed by a propeller. Assume that the thrust P depends on the angular velocity ω, speed of advance V, diameter D, dynamic viscosity μ, mass density ρ, elasticity of the fluid medium which can be denoted by the speed of the sound in the medium C.   **10**

B   A lawn sprinkler has two nozzles of diameter 10 mm each at the end of a rotating arm   **10**
and the velocity of flow of water from each nozzle is 12 m/sec. One nozzle discharges water in the downward direction, while the other nozzle discharges water vertically up. The nozzles are at distance of 42 cm from the center of the rotating arm. Determine the torque required to hold the rotating arm stationary. Also determine the constant speed of rotation of arm, if it is free to rotate.

Q3   **A**   What are the methods of dimensional analysis) Explain it.   **10**
B   What is jet propulsion of ship ? Explain with neat sketch.   **10**

Q4   **A**   A jet of water having a velocity of 15 m/s strikes a curved vane, which is moving   **10**
with a velocity of 5 m/s in the same direction as that of the jet at inlet. The vane is so shaped that the jet is deflected through 135 degrees. The diameter of jet is 100 mm. Assuming the vane to be smooth, find force exerted by the jet on the vane in the direction of motion, power exerted on the vane and efficiency of the vane.
B   A turbine is to operate under a head of 25 m at 200 r.p.m. The discharge is 9 cumec.   **10**
If the efficiency is 90%, determine the performance of the turbine under a head of 20 meters.

Q5   **A**   Define cavitations. What are the effects of cavitations?   **5**
B   What do you mean by multistage pumps   **5**
C   The discharge through a rectangular channel of width 6 m, is 18 m³/sec when depth of   **10**
flow of water is 2 m. Calculate i) Specific energy of the flowing water, ii) Critical depth and critical velocity and iii) Value of minimum specific energy.

Q6   **A**   Describe briefly the functions of main components of Pelton wheel turbine with neat   **10**
sketches
B   Explain hydraulic jump. And Derive an expression for loss of energy due to hydraulic jump.

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