15168

B. Tech 5th Semester Examination

Fluid Machines (NS)

ME-311

Time : 3 Hours   **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five question in all selecting one question from each section A, B, C and D. Section-E is compulsory. Assume any missing data.

SECTION - A

1. A nozzle of 60 mm diameter delivers a stream of water at 24 m/s perpendicular to a plate that moves away from the jet at 6m/s. Find:

   (a)   The force on the plate

   (b)   The work done and

   (c)   The efficiency of the jet.   (20)

2. With the help of neat diagram explain the construction and working of a Pelton wheel turbine.   (20)

SECTION - B

3. A reaction turbine works at 450 rpm under a head of 120m. Its diameter at inlet is 120cm and the flow area is 0.4m^2. The angle made by absolute and relative velocity at inlet are 20º and 60º respectively with the tangential velocity. Determine:

   (a)   The volume flow rate

[P.T.O.]

   (b)   The power developed and

   (c)   The hydraulic efficiency.   (20)

4. (a)   What is a draft tube and what are its functions? Discuss.   (10)

   (b)   Differentiate between a propeller turbine and a Kaplan turbine.   (10)

SECTION - C

5. What are the various methods of dimensional analysis to obtain a functional relationship between different parameters affecting a physical phenomenon? Describe with an illustration.   (20)

6. Discuss the construction and operation of a hydraulic ram with the help of a sketch.   (20)

SECTION - D

7. The impeller of a centrifugal pump has an external diameter of 400mm and internal diameter of 180mm and it runs at 1440 rpm. Assuming a constant radial flow through the impeller at 2.5m/s and that the vanes at the exit are set back at an angle of 25º, determine:

   (i)   Inlet vane angle

   (ii)   The angle, absolute velocity of water at the exit makes with the tangent and

   (iii)   The work done per N of water.   (20)

8. A single acting reciprocating pump has a stroke length of 150mm, suction pipe is 7m long and the ratio of suction pipe diameter to the piston diameter is 3/4. The water level in the sump is 2.5m below the axis of the pump cylinder and the pipe connecting the sump and pump cylinder is 75mm in diameter. If the crank is running at 75 rpm, determine the pressure head on the piston at the beginning, middle and end of the suction stroke. Take friction coefficient f=0.01.   (20)

SECTION - E

9. (a)   What do you understand by impact of jet?

    (b)   How turbines are classified?

    (c)   Define degree of reaction.

    (d)   What is cavitation and its causes?

    (e)   What is the function of a hydraulic intensifier.

    (f)   What are multistage pumps?

    (g)   Define hydraulic efficiency.

    (h)   Why air vessels are used in reciprocating pump?

    (i)   Define the unit quantities for a turbine.

    (j)   What is meant by speed ratio of a pelton wheel.

                                        (2×10=20)