Exam.Code:0941
Sub. Code: 33867

2076
B. E. (Mechanical Engineering)
Fifth Semester
MEC-506: Fluid Machinery

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt <u>five</u> questions in all, including Question No. I (section-A) which is compulsory and selecting two questions each from Section B-C.

x-x-x

Section – A (2 marks each)

Q 1 **a)** What is the Jet Ratio in a Pelton wheel. On what factors does it depends

b) What are the different types of draft tubes used in reaction turbines.

c) Define Sound and Noise.

d) Define specific speed and explain its importance in turbine and pump selection

e) State the advantages of using an Air Vessel in a reciprocating pump.

Section – B (10 marks)

Q 2 A Francis turbine has to be designed to develop **367.5 kW** under a head of **H = 70 m** while running at **N = 750 r.p.m.** Ratio of width of runner to diameter of runner, n = **0.1**, inner diameter is half the outer diameter. Flow ratio = **0.15**, hydraulic efficiency = **95%**, mechanical efficiency = **84%**. Four percent of the circumferential area of runner to be occupied by the thickness of vanes, velocity of flow is constant and the discharge is radial at exit. Calculate: (i) The diameter of the wheel, (ii) The quantity of water supplied, and (iii) The guide vane angle at inlet and runner vane angles at inlet & exit.

Q 3 **(a)** Explain the different characteristic curves such as main, operating, and constant efficiency curves, and describe their significance in evaluating turbine performance.

(b) A turbine is to operate under a head of **25 m** at **200 r.p.m.** The discharge is **9 m^3/s.** If the overall efficiency is **90 percent**, determine: (i) Power generated; (ii) Specific speed of the turbine; (iii) Type of turbine. **(7,3)**

Q 4 **(a)** Write a short note on the (i) Pump Noise (ii) Compressor and Turbine Noise.

(b) Explain the procedure for selecting suitable fans and pumps using vendor data.

(5,5)

P.T.O.

Section – C (10 marks)

Q 5. A three-stage centrifugal pump has an impeller of **40 cm** diameter and **2.5 cm** width at the outlet. The vanes are curved back at the outlet at **30°** and reduce the circumferential area by **15%.** The manometric efficiency per stage and overall efficiency of the pump are **85%** and **75%**, respectively. Determine the head generated by the pump when running at **1200 r.p.m.** and delivering a discharge of **0.06 m³/s**. Also, find the shaft power required to drive the pump.

Q 6. The piston diameter and stroke length of a single acting reciprocating pump are **150 mm** and **300 mm** respectively. The centre of the pump is **5 m** above the water level in the sump and **33 m** below the delivery water level. Both the suction and delivery pipes have the same diameter of **75 mm** and are **65 m** and **39 m** long respectively. If the pump is working at **30 r.p.m.** determine: (i) The pressure head on the piston at the beginning, middle and end of both suction and delivery strokes, and (ii) The power required to drive the pump. Take atmospheric pressure head = **10.3 m** of water and friction co-efficient, $f = 0.01$ for both the pipes.

Q 7. a) Differentiate between Simple Hydraulic Accumulator and Differential Hydraulic Accumulator on the basis of their construction and working, with the help of neat & labeled diagrams.

b) Explain in brief the construction and working of a Hydraulic Ram with the help of a neat & labeled diagram. Also, write down the equations related to its efficiency.

(6, 4)

x-x-x