Printed Pages: 02 **Sub Code: ME401**

Paper Id: **140205** **Roll No.** | | | | | | | | | | |

B. TECH.
(SEM IV) THEORY EXAMINATION 2018-19
FLUID MACHINERY

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.
2. Be precise in your answer. Draw neat diagrams wherever necessary.

SECTION A

1. Attempt *all* questions in brief. **2 x10 = 20**

a. What is the difference between momentum and change in momentum?

b. What are Euler's equations of motion?

c. What is the process of impulse and reaction turbine?

d. What type of compounding is used for impulse and reaction turbines?

e. What is the difference between a Pelton wheel and the Francis and Kaplan turbines? Where they are used, and why?

f. What is the difference between cavitation and separation in the case of a pump?

g. How much work is saved by using an air vessel in a reciprocating compressor?

h. What is the operating principle of an accumulator in a hydraulic system?

i. Enumerate the application of a hydraulic intensifier used in a hydraulic system?

j. What is the operating principle of a hydraulic lift?

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

a. Why the hemispherical vanes are preferred to flat vanes in impulse turbines? Calculate the force exerted by the jet when jet strikes the curved fixed vane at one end tangentially when the plate is unsymmetrical.

b. What is the significance of the degree of reaction in a steam turbine? Derive an expression for degree of reaction for Francis turbine.

c. Define the specific speed of a centrifugal pump. Derive expression for the same in terms of head, discharge and speed.

d. Show from the first principles that work saved in a single-acting reciprocating pump, by fitting an air vessel, is 84.8 percent.

e. What is function of torque converter? Describe with the help of a neat sketch its constructional features and working. Discuss its characteristics. State its merits, limitations and applications.

SECTION C

3. Attempt any one part of the following: 10 x 1= 10

(a) Explain gross head, effective head (net head), hydraulic, mechanical and overall efficiencies of a Pelton turbine.

(b) A Pelton wheel is supplied with water under a head of 50 m at a rate of 25 m^3/min. The jet strikes the buckets in center of bucket, and it is deflected through an angle of 165°. The mean bucket speed is 15 m/s. Calculate the power and hydraulic efficiency of the machine. Assume $C_V = 1$.

4. Attempt any one part of the following: 10 x 1 = 10

(a) Explain the terms with reference to the hydraulic turbine, Unit Discharge, Unit Power, Unit Speed.

(b) A conical draft tube is 5 m long and 1 m of its bottom is immerged under tail race. The inlet and exit diameters are 0.8 m and 1.2 m respectively. The water leaving the draft tube has a velocity of 2.8 m/s. The friction loss in the tube is equivalent to 8% of velocity head at inlet of draft tube. Find the pressure at inlet and efficiency of draft tube.

5. Attempt any one part of the following: 10 x 1 = 10

(a) What is priming of centrifugal pump? Explain why priming is necessary to start pumping by centrifugal pump.

(b) Explain different heads and efficiencies of centrifugal pump.

6. Attempt any one part of the following: 10 x 1 = 10

(a) Obtain an expression for the pressure head due to acceleration in the suction and delivery pipes.

(b) The cross-sectional area of plunger equals 1.65 times that of a delivery pipe. The delivery pipe is 55 m long and it rises upward at a slope of 1 in 5. If the plunger has an acceleration of 2.5 m/s2 at the end of the stroke and separation pressure is 2.5 m of water find whether separation will take place and, if so, at which section of the pipe. Assume simple harmonic motion and take atmospheric pressure = 10·3 m of water

7. Attempt any one part of the following: 10 x 1 = 10

(a) What is hydraulic accumulator? Obtain an expression for the capacity of a hydraulic accumulator.

(b) The following data refers to a hydraulic ram:
Supply head 2.2 m; weight of waste water per minute 170 N; weight of water pumped per minute 5N and net head pumped from the ram 40 m. Calculate D'Aubuisson's and Rankine's efficiencies.