

TME-604

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Even Semester Examination 2017-18

B.TECH. (SEMESTER-VI)

FLUID MACHINERY

Time: 03:00 Hours

Max Marks : 100

Note : All questions are compulsory.

1. Attempt any four questions

(5×4 = 20)

- (a) What is the cavitation & priming of centrifugal pump?
- (b) Explain the differentiate between reciprocating pump & centrifugal pump.
- (c) Derive an expression for the force exerted by a jet of water on a moving curved plate in the direction of jet. Prove that :
 - (1) $V=3u$
 - (2) $\text{Max. Eff.} = (1+\cos\theta)8/27$
- (d) What do you mean by characteristic curve of a turbine? Discuss different operating characteristic curves for reaction turbines.
- (e) Explain governing mechanism in Pelton turbine with neat sketch.
- (f) Explain the working of pelton turbine with neat sketch.

2. Attempt any four questions

(5×4 = 20)

- (a) A jet of water 8 cm in diameter and at a velocity of 20 m/s of curved vanes at the centre moving a velocity of 7 m/s. The vanes are so arranged that each vane appears before the jet in the same position and at the same velocity. The jet is deflected through 160° . Find the normal force exerted on vanes, the work done per second & the efficiency of the system.

- (b) What is degree of reaction? Also explain the degree of reaction for reaction turbine.
- (c) Define Euler's equation for turbomachinery with velocity triangles at inlet and outlet.
- (d) What is the role of a draft tube? Define the efficiency of draft tube.
- (e) What is the difference between outward flow & inward flow reaction turbine?
- (f) What are the difference between model and prototype machine.

3. Attempt any two questions

(10×2 = 20)

- (a) The runner of an inward flow reaction turbine runs at 300 rpm and the turbine works under a head of 30 m. Outer & inner diameter of wheel are 2m & 1m respectively. The velocity of flow is 4.5 m/s throughout the discharge is radial. Find:
 - 1) Guide vane angle at inlet
 - 2) Inlet & outlet moving vane angles
 - 3) Hydraulic losses as percentage of total available head.
- (b) What is specific speed? Also explain the specific speed for centrifugal pump & turbines.
- (c) A Kaplan turbine working under a head of 20 m develops 15 MW brake power. The hub and runner diameter of the turbine are 1.5 m and 4 m respectively. The guide blade angle at the inlet is 30° . The hydraulic and overall efficiency is 0.9 & 0.8 respectively. The discharge is radial. Find out the runner vane angles & turbine speed.

4. Attempt any two questions

(10×2 = 20)

- (a) An impeller of inside diameter 15 cm and outside diameter 40 cm having width at inlet & width at outlet 2 cm is running at 1440 rpm. The inlet & outlet blade angles are 25° & 15° respectively. The whirl velocity at inlet is zero. Find :

- a) flow rate(Ltr/min)
 - b) power of impeller
 - c) absolute velocity at outlet.
- (b) Design a Pelton wheel which working under a head of 80 m at 300 rpm. It produces a power of 125 kW with an overall efficiency of 85%. The speed ratio for the turbine is 0.45 and the coefficient of velocity of nozzle is 0.98.
- (c) What is air vessel? Describe the function of air vessel with the help of neat sketch. Prove that the work saved by fitting the air vessel to reciprocating pump is 84.8% in case of single acting reciprocating pump & 39.2% for double acting reciprocating pump.

5. Attempt any two questions (10×2 = 20)

- (a) Draw the indicator diagram for reciprocating pump considering acceleration and friction head in suction & delivery pipes and find an expression for the work done for a single acting reciprocating pump.
- (b) Explain the working of hydraulic ram with the help of sketch. What is its advantage? Also explain the characteristic curves for hydraulic ram.
- (c) Write short notes any one with neat sketch:
 - a) Hydraulic accumulator and Hydraulic intensifier
 - b) Hydraulic press and Hydraulic torque convertor

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