

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2528

Roll No.

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B.Tech.

(SEM. VI) EVEN THEORY EXAMINATION 2012-13

FLUID MACHINERY*Time : 3 Hours**Total Marks : 100***Note :-** (1) Attempt **all** questions.

(2) All questions carry equal marks.

(3) Assume suitably any relevant data, if required.

1. Attempt any **two** out of the following : **(10×2=20)**

- (a) Derive an expression for Euler's momentum equation as used in turbomachines.
- (b) A jet of water enters a series of radially fixed vanes with a velocity of 60 m/s and at an angle 20° with the tangent. Jet leaves the vanes radially with a velocity of 10 m/s. The wheel rotates at 300 rpm and its diameter at entrance and exit are 3 m and 2 m respectively. Determine (i) the work done per kg of water (ii) the blade angles. Assume water enters and leaves without shock. (iii) Draw velocity triangles at entry and exit.
- (c) A Pelton wheel having a mean bucket diameter of 0.8 m is running at 1000 rpm. The jet impinges at the centre of bucket and is deflected by an angle of 165° . The net head on the Pelton wheel is 400 m, and the discharge through nozzle is 150 lit/s. Calculate (i) runner power (ii) hydraulic efficiency and (iii) clearly draw the inlet and outlet velocity triangles.

2. Attempt any two out of the following : (10×2=20)

- (a) Derive an expression for the specific speed of a hydraulic turbine. Discuss the significance of specific speed.
- (b) Derive an expression for degree of reaction in relation to hydraulic turbines. Explain fast, medium and slow runner according to the ranges of degree of reaction.
- (c) Determine (i) inner and outer diameters (ii) the guide blade angle and (iii) runner blade angles (inlet and outlet) for an inward flow reaction turbine using the data given below :

Net head	= 63 m
Speed	= 700 rpm
Output power	= 336 kW
Hydraulic efficiency	= 94%
Mechanical efficiency	= 85%
Flow ratio	= 0.15
Wheel width at inlet	= 0.1
Wheel diameter at inlet	
Inner diameter	= 0.5
Outer diameter	

Assume constant velocity of flow and radial discharge.
Neglect blade thickness.

3. Attempt any two out of the following : (10×2=20)

- (a) Draw a neat sketch of centrifugal pump installation and explain Euler's head, manometric head, manometric efficiency, mechanical efficiency and overall efficiency.

(b) Discuss the phenomenon of cavitation in centrifugal pump. What are the factors that influence the cavitation. Discuss the effect of suction lift in detail on the cavitation.

- (c) A centrifugal pump running at 1000 rpm delivers water against a net head (Manometric head) of 15 m. The vanes are curved backward to an angle of 30° with the tangent on periphery. The impeller diameter is 0.30 m and outlet width 0.05 m. Manometric efficiency is 95% and water enters the wheel radially. Determine the discharge of the pump.

4. Attempt any two out of the following : (10×2=20)

- (a) Derive an expression for acceleration head in case of reciprocating pump. Show the effect on indicator diagram. What restrictions does the acceleration head impose on the performance of a reciprocating pump.
- (b) With the help of a neat sketch, explain the principle and working of a vane pump.
- (c) A single cylinder, single acting reciprocating pump is installed 3.50 m above the water level in the sump. Diameter of suction pipe is 225 mm and length is 9.5 m long. The cylinder bore is 300 and stroke 450 mm. Barometric head = 9.6 m of water. Separation occurs at 2.4 m of water absolute. Friction factor = 0.04. Find (i) the speed at which separation may take place at the commencement of suction stroke, and (ii) the speed of the pump if air vessel is fitted in the suction side, 2.4 m above the sump water level.

5. Attempt any **two** out of the following : (10×2=20)

- (a) Sketch and describe the construction and working of an air lift pump.
- (b) Sketch and explain principle of hydraulic coupling. Draw the efficiency curve. How is hydraulic coupling different from a torque converter.
- (c) Draw a neat sketch to explain working of a hydraulic press. What constitutes the mechanical advantage and the leverage of the hydraulic press.