

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

PAPER ID : 4096

Roll No.

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B. Tech.

(SEM. VI) EXAMINATION, 2007-08

FLUID MACHINERY

Time : 3 Hours]

[Total Marks : 100

Note :

(i) Answer **all** questions.

(ii) Each question carries **equal** marks.

(iii) Assume suitable data, wherever necessary.

(iv) Give precise answer to the question.

1 Attempt any **two** parts of the following : 10×2

- (a) Derive the expression for the force exerted by the jet on the moving flat plate which is inclined at an angle θ .
- (b) In a Pelton turbine, explain the following :
 - (i) Working principle
 - (ii) Wheel geometry with layout
 - (iii) Governing of pelton turbine.
- (c) Define the term degree of reaction as applied to hydraulic turbine. Is it possible to have a turbine with 100% degree of reaction ? If not why ?



- (a) Explain theory of operation and application with sketch of a Francis turbine.
- (b) Why the efficiency of Kaplan turbine nearly constant irrespective of speed variation under a load ? Explain.
- (c) Determine the type and number of turbines required for a hydro power station where a total flow of 150 cumecs is available under a head of 35 meter. The speed and overall efficiency of each machine should be 175 rpm and 90% respectively. The specific speed of each machine should not exceed 250.

3 Attempt any **two** parts of the following : **10×2**

- (a) Derive the expression for work done by the centrifugal pump (Impeller) on water.
- (b) Explain :
- (i) Types of vane in a centrifugal pump and also draw the characteristic curve between (a) Actual Head Vs Discharge (b) Power Vs Discharge for different types of vane.
- (ii) What is N.P.S.H. ?
- (c) Centrifugal Pump (with $D=8$ in Impeller) operated at $N = 1170$ rpm.

| | | |
|-----------------|------|------|
| Q (gpm) | 0 | 300 |
| H (Ft of water) | 25.0 | 21.9 |



Find :

- (i) The equation of parabola through the pump characteristics at 1107 rpm
- (ii) The corresponding equation for new operating speed of 1750 rpm.

4 Attempt any **two** parts of the following : **10×2**

- (a) In a reciprocating pump define :
 - (i) Slip
 - (ii) Negative slip
 - (iii) Coefficient of discharge
 - (iv) Separation and its effect.
- (b) Explain the air vessel in the reciprocating pump and its advantage.
- (c) A reciprocating pump is fitted with an air vessel on the delivery side. The diameter and the stroke of the piston are 30 cm and 45 cm respectively. The crank rotates at 60 rpm. The delivery pipe is 15 cm in diameter and 50 cm long. Determine the power saved in overcoming friction in the delivery pipe by the vessel ($f = 0.02$)



- (a) Explain the details construction and details of the hydraulic ram.
- (b) Differentiate the air lift and jet pump in detail.
- (c) The ram and plunger of a hydraulic press are 150 mm and 125 mm in diameter respectively. With a plunger stroke of 300 mm, the press is able to lift a load of 10 KN through 1.6 m in 30 seconds. What is (i) Load on the plunger (ii) power required to drive the plunger (iii) Number of strokes done by the pump.