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

PAPER ID : 4096 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. VI) THEORY EXAMINATION 2010-11

FLUID MACHINERY

Time : 3 Hours *Total Marks : 100*

Note : (1) Attempt all questions.

(2) All questions carry equal marks.

(3) Assume missing data, suitably, if missing.

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

(a) Derive an expression for the force exerted by the jet on the moving flat plate, which is inclined at an angle of α from the jet axis. Explain the effect of inclination of the plate.

(b) Discuss the difference between impulse and reaction turbine.

(c) A Pelton wheel is supplied with water under a head of 30m at a rate of 41m^3/min. The buckets deflect the jet through an angle of 160° and the mean bucket speed is 12 m/s. Calculate the power & hydraulic efficiency of turbine.

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

(a) Describe with the help of a labelled sketch construction & working of a Kaplan turbine. Why is the efficiency of

Kaplan turbine nearly constant, irrespective of speed variation under load.

(b) Discuss main and operating characteristics of a hydraulic turbine.

(c) Answer the following :

(i) Define unit speed, unit power & unit discharge.

(ii) Determine the power available & no. of turbines required for a hydroelectric station with following data :

Head available = 60 m

Water available = $33 m^3/s$

Specific speed of turbines to be installed = 190

rpm. of turbines = 500

Overall efficiency = 82%

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

(a) Explain the following :

(i) Function of volute casing and diffuser of a centrifugal pump.

(ii) Cavitation in centrifugal pump.

(b) Define specific speed of a centrifugal pump & derive an expression for the same.

(c) A centrifugal pump delivers water against a net head of 15 m at a speed of 1000 rpm. The vanes of the impeller are curved backward to an angle of 30° with the periphery. The impeller diameter is 300 mm. and outlet width is 50 mm. Manometric efficiency is 95%. Determine the discharge of the pump.

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

(a) With the help of a neat sketch, explain construction & working of Vane pump.

(b) (i) Explain the effect of bend in delivery pipe of reciprocating pump.

(ii) Discuss the difference between centrifugal & reciprocating pump.

(c) A single acting reciprocating pump has a plunger diameter of 10 cm and stroke 20cm.The centre of pump is 4 m above the water level in the sump and 14 m below the water level in the upper tank. The diameter & length of suction pipe are 4 cm and 6 m respectively, while that of delivery pipe are 3cm and 18 m respectively.

Find maximum speed at which pump may be run without separation, if the separation occurs at 7.85 N/cm^2, below the atmospheric pressure. Take atmospheric pressure as 10.3 m of water column.

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

(a) Discuss the construction and working of Jet pump.

(b) Discuss the construction and working of hydraulic intensifier.

(c) Discuss the construction and working of hydraulic crane.