Civil - Sem-V - old - AH-I - 24/11/2015

**QP Code : 1646**

**(3 Hours)** **[Total Marks : 100**

N.B:- 1) Question No.1 is compulsory

2) Solve any four questions from remaining questions.

3) If required assume suitable data.

Q.1. Solve any four (20)

a) Explain impulse Momentum equation.

b) Write a note on Weber Model Law. Also write its applications.

c) Show that the angle of Swing Vertical Hinged Plate is given by $\sin\theta = \frac{\rho a v^2}{W}$

d) Write a short note on specific speed of Turbine.

e) Explain Cavitation in Centrifugal Pumps.

f) Write a short note on Hydraulic Ram.

Q. 2 a) The angle of a reducing bend $60^0$ (that is deviation from initial direction to final direction) its initial diameter 150 mm and is fitted in a pipeline carrying a discharge of 360 ltrs/sec. The pressure at the commencement of the bend is 2.943bar.The friction loss in the pipe bend may be assumed as 10 percent of kinetic energy at exit of the bend. Determine the force exerted by the reducing bend. (10)

b) A Lawn Sprinkler with two nozzl3es of diameters 3mm each is connected across a tap of water. The nozzles are at a distance of 40 cm and 30 cm from the centre of the tap. The rate of water through tap is 100 $cm^3$ /s. The nozzle discharges water in the downward directions. Determine the angular speed at which the sprinkler will rotate free (10)

Q. 3. a) 4137m diameter jet of water issuing from a nozzle impinges on the buckets of a pelton wheel and the jet is deflected through an angle of $165^0$ by the buckets. The head available at the nozzle is 400m. Assuming coefficient of velocity as 0.97 speed ratios 0.46 and reduction in relative velocity while passing through buckets as 15%.

Find i) The force exerted by the jet buckets in tangential direction.

ii) The power developed. (10)

**[TURN OVER**

**QP-Con. 8073 -15.**

b) A Kaplan turbine working under a head of 2.5m develops 16000kw shaft power. The outer diameter of the runner is 4m and hub diameter is 2m. The guide blade angle is $35^0$. The hydraulic and overall efficiency are 90% and 85% respectively. If the velocity of whirl at zero at outlet determine runner vane angles at inlet and outlet, the speed of turbine. (10)

Q.4. a) The drag force $f_D$ on sphere in laminar flow is known to depend on its diameter D, velocity of flow V, density of fluid and coefficient of viscosity μ. Obtain an expression for $f_D$. (10)

b) A 7.2 m high and 15m long spillway discharges 94 $m^3/s$ discharge under a head of 2.03 If 1:9 scale model of this spillway is to be constructed, determine model dimensions, head over spillway model and the model discharge. If the model experiences a force of 7500N. Determine force on the prototype. (10)

Q.5. a) A centrifugal pump with 1.25m diameter runs at 210rpm and pumps 1900 ltr/s. The average lift being 6m. The angle which the vanes make at exit with the tangent to the impeller is $26^0$ and radial velocity of flow is 2.5 m/s. Determine the manometric efficiency and the least speed to start pumping against a head of 6m. The inner diameter of impeller being 0.6m. (10)

b) A homogenous model of centrifugal pump runs at 600 rpm against a head of 8m the power reaction turbine. The power required being 5kw. If the prototype 5 times the model size is to develop a head of 40m, determine its speed, discharge & power. The overall efficiency of the model is 0.8 while is that of prototype is 0.85. (10)

Q.6 a)Differentiate between impulse turbine and reaction turbine. Describe briefly the functions of various main components of Pelton Turbine. (10)

b) What is cavitation? What are its causes? Describe preventive measure to avoid cavitation in hydraulic machines. (10)

Q.7. a) What are the methods of dimensional analysis) Explain it. (10)

b) A conical draft tube having at inlet and outlet diameters 1m and 1.5m discharges water at outlet with a velocity of 2.5 m/s. The total length of the draft tube is 8m and 1.4m of the length of draft tube is immersed in water. If the atmospheric pressure head as 10.3m of water and loss of head due to friction in the draft tube is equal to 0.2x velocity at outlet of the tube.

Find: i) Pressure head at inlet

ii) Efficiency of the draft tube. (10)

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Course: T.E. (SEM.-V) (REV.-2007) (CIVIL ENGG) (CBSGS) (Prog T2615) old

QP Code: 1646

Correction:

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Q.no. 2 (b)

Read As:

A sprinkler with two **nozzles**.....rotate free

Instead of:

A sprinkler with two **nozzl3es**.....rotate free

Q.no. 3(a)

Read As:

**A 137 mm** diameter jet of water.....buckets as 15%.

Instead of:

**4137m** diameter jet of water.....buckets as 15%.

Q.no. 3(b)

Read As:

A Kaplan turbine working under head of **25 m** develops.....runner is **4 cm**.....speed of turbine

Instead of:

A Kaplan turbine working under head of **2.5** m develops.....runner is **4 m**.....speed of turbine

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Query Update time: 24/11/2015 04: 00 PM