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BICE-025

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

00606

June, 2016

BICE-025 : HYDRAULICS AND HYDRAULIC MACHINES

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **seven** questions. All questions carry equal marks. Use of scientific calculator is allowed.*

1. Differentiate between impulse and reaction turbines. Provide examples of each, along with neat sketches. *10*

2. Define specific speed. Derive the expression for specific speed of a turbine. *10*

3. A 3-stage centrifugal pump delivers 0·05 m^3/s of water, when running at 1000 rpm. The diameter and width of impeller at outlet are 0·38 m and 0·025 m, respectively. The outlet vane angle is 45°. There is 6% reduction in flow area at outlet due to the thickness of the vanes. The mechanical and manometric efficiencies are 95% and 80%, respectively. Find the manometric head, specific speed and power of the pump. *10*

4. Describe in detail, the classification of channels based on flow properties. *10*

5. In a rectangular channel of base width 5 m laid on a bed slope of 1 in 1000, the normal depth of flow is 2 m. It is desired to provide a hump in the flow without affecting the afflux. What is the maximum height of the hump ? Take Manning's n = 0·02. *10*

6. Calculate the optimum channel section required for a trapezoidal channel to discharge 3·5 m^3/s with a velocity of 0·5 m/s. The allowable side slope for the channel is 1 : 1·25. Assume a Manning's factor of 0·02. Find the values of section factor and normal conveyance. Also find the corresponding critical section factor. *10*

7. Derive the conditions required for most efficient circular section. *10*

8. (a) Explain the phenomenon of hydraulic jump. *3*

   (b) A 50 m wide spillway chute is designed to carry a maximum discharge of 100 m^3/s and has a bed slope of 3H : 1V. A hydraulic jump is formed on the chute at a point where the pre-jump flow depth is 0·3 m. What would be the post-jump depth ? Estimate the length of jump and energy loss. *7*

9. Differentiate between the following : *5+5=10*

   (a) Positive and Negative Surge

   (b) Pumps and Machines (Rotodynamic)
