JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -2 EXAMINATION- October 2018
Dr. Ashish
B.TechVII Semester

COURSE CODE: 10B1W CE732   MAX. MARKS: 25
COURSE NAME: Hydropower Engineering
COURSE CREDITS: 03   MAX. TIME: 1Hr 30 Min

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. **Assume suitable data if required. Notation has their usual meanings.**

Q1. Differentiate between inward flow and Outward flow reaction turbine with neat sketch.   [3]

Q2. (a) What is a draft tube? Why it is used in a reaction turbine?   [2]

   (b) A turbine is to operate under a head of 25 m at 200rpm. The discharge is 9m^3/s. If the efficiency of turbine is 90% determine the performance of the turbine under a head of 20 m.   [2]

Q3. A Kaplan turbine working under a head of 20 m develops 12 MW. The outer diameter of the runner is 3.5 m and hub diameter is 1.75 m. the guide blade angle at entrance edge of the runner is 35°. The hydraulic and overall efficiency of turbine is 88% and 85%. Find out the speed of the turbine.   [3]

Q4. At a proposed site of hydroelectric power plant the available discharge and head is 30m^3/s and 28 m respectively. The turbine efficiency is 86%. The generator is directly coupled with the turbine. The speed of the turbine is to be kept at 250rpm. Find the least number of the machines required if

   (a) A Francis turbine with a specific speed of 260 is used

   (b) A Kaplan turbine with a specific speed of 700 is used   [4]

Q5. The peripheral velocity at inlet of an outward flow reaction turbine is 12 m/s. The internal diameter is 0.8 times the external diameter. The vanes are radial at the entrance and the vane angle at outlet is 20°. The velocity of flow through the runner at inlet is 4m/s. if the final discharge is radial. Determine

   (a) The guide blade angle

   (b) The absolute velocity of water leaving the guide vanes

   (c) The head on the turbine

   (d) The hydraulic efficiency   [6]

Q6. A Francis turbine with an overall efficiency of 70% is required to produce 147.15 Kw .it is working under a head of 8 meter. The peripheral velocity is 0.3(2gH)$^{1/2}$ and radial velocity of flow at inlet is 0.96(2gH)$^{1/2}$. The wheel runs at a speed of 200 rpm and the hydraulic losses in the turbine are 20% of the available energy. determine   [5]

   (a)   guide blade angle
   (b)   wheel vane angle at inlet
   (c)   diameter of wheel at inlet
   (d)   width of wheel at inlet