TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING
ECE 2312 HYDRAULICS II
END OF SEMESTER EXAMINATION
SERIES: sept. 2017
TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination
-Answer Booklet, examination pass and student ID
This paper consists of five questions.
Answer question ONE (COMPULSORY) and any other TWO questions
Do not write on the question paper.

QUESTION ONE (COMPULSORY)

a) Define the following terms. **(6Mks)**
   i) Net or effective head of a turbine
   ii) Hydraulic efficiency
   iii) Mechanical efficiency
b) Describe the two basic types of turbines **(4Mks)**
c) A turbine is to operate under a head of 25m at 200rpm the discharge is $9m^3/s$. If the overall efficiency is 90%. Determine:
   i) Power generated
   ii) Specific speed of the turbine
   iv) Type of turbine **(10Mks)**
d) Given the following pump characteristics $Q=44.16M^3/s$ N= 12rpm H=36.58
   i) Calculate the specific speed of the pump
   ii) At its rated capacity of $44.16m^3/s$ this pump develops 36.58m of head when operated at 1450rpm.Calculate
      - The head
      - Discharge
      - Power required **(10Mks)**

ATTEMPT ANY TWO QUESTIONS

QUESTION TWO

A Pelton wheel is to be designed for the following specifications

Power	9560Kw
Head	350metres
Speed	750rpm
Overall efficiency	85%
Jet diameter	Not to exceed 1/6 of the wheel diameter

Calculate the following

i) The wheel diameter
ii) Diameter of the jet and
iii) The number of jets required

Take $C_V = 0.985$; speed ratio 0.54 **(20Mks)**

QUESTION THREE

A centrifugal pump impeller having an external and internal diameter 480mm and 240mm respectively is running at 100rpm. The rate of flow through the pump is $0.0576m^3/s$ and velocity of flow is constant and equal to 2.4m/s; the diameters of the suction and delivery pipes are 180mm and 120mm respectively. If the power required to drive the pump is 23.3kW and the outlet vane angle is 45^0.Determine

i) Inlet vane
ii) The overall efficiency of the pump
iii) Manometric efficiency of the pump **(20Mks)**

QUESTION FOUR

a) Define the term cavitation. **(2Mks)**

b) Determine the maximum permissible elevation above tailwater for the setting of a Francis turbine ($_S = 80$ $O_C = 0.40$) to operate under a head of 16.764m at an elevation of 1524m with water temperature at 60^0F. **(8Mks)**

c) A pump with critical value of $O_C = 0.1$ is to pump against a head of 150m. The barometric pressure is $98.5KN/M^2$ abs. taking the friction losses in the intake to be 1.5m. Find the maximum allowable height of the pump relative to the water surface at intake.

QUESTION FIVE

a) Describe the suction pipe **(4Mks)**

b) A centrifugal pump is to discharge $0.118m^3/s$ at a speed of 1450rpm against a head of 25m.The impeller diameter is 250mm, its 50mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller.
(16Mks)