INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)
End Semester Examination Dec 2019/Jan 2020
B.Tech (Marine Engineering)
Semester -V
UG11T1504/2504- Fluid Mechanics-II

Date: 16.12.2019	**Max Marks: 70**
Time: 3 Hours	**Pass Marks: 35**

Part – A (compulsory)
Answer the following (10x2=20 Marks)

1. What is priming? Why it is necessary in a Centrifugal pump?
2. When does negative slip occurs in reciprocating pump?
3. What are the limitations of Rayleigh's method for dimensional analysis?
4. What is the function of casing in Pelton turbine?
5. Why vortex casing is used in centrifugal pump?
6. Define Froude model law.
7. Define distorted and undistorted models
8. Write expression for pressure head due to acceleration in the suction and delivery pipes in reciprocating pump.
9. What is the significance of Draft tube in turbines?
10. Draw operating characteristic curve for turbine.

Part – B

Answer any 5 out of 7 questions (5 x 10= 50 marks)

11. A centrifugal pump is running at 1000 rpm.The outlet vane angle of the impeller is 45^0 and velocity of flow at outlet is 2.5 m/s.The discharge through pump is 200 lit/s when the pump is working against a total head of 20 m.If the manometric efficiency of the pump is 80%,Determine a] The outer diameter of impeller b] The width of the impeller at outlet.

[10 Marks]

12. A single acting reciprocating pump has a plunger diameter of 250 mm and stroke of 450 mm and it is driven with SHM at 60 rpm.The length and diameter of delivery pipe are 60 m and 100 mm resp.Determine the power saved in overcoming friction in the delivery pipe by fitting an air vessel on the delivery side of the pump.Assume friction factor =0.01.

[10 Marks]

13. A 7.2 m height and 15 m long spillway discharges 94 m^3/s discharge under a head of 2 m.If a 1:9 scale model of this spillway is to be constructed determine the model dimensions ,head over spillway model and model discharge.If the model experiences a force of 7500 N determine the force on prototype. **[10 Marks]**

14. The pressure difference in a pipe if diameter D and length due to turbulent flow depends on velocity,dynamic viscosity,density and roughness.Using Buckingham's theorem obtain an expression for pressure difference.

[10 Marks]

15. The penstock supplies water from a reservoir to the pelton wheel with a gross head of 500 m.One third of gross head is lost on friction in the penstock .The rate of flow of water through the nozzle fitted at the end of penstock is 2.0 m^3/s.The angle of deflection of the jet is 165^0.Determine the power given by the water to the runner and also hydraulic efficiency of the pelton wheel.Assume speed ratio=0.45 and C_V=1.0. [**10 Marks**]

16. An inward flow reaction turbine has external and internal diameters as 1.0 m and 0.6 m resp.The hydraulic efficiency of the turbine is 90% when the head on the turbine is 36 m.The velocity of flow at outlet is 2.5 m/s and discharge at outlet is radial.If the vane angle at outlet is 15^0 and width of the wheel is 100 mm at inlet and outlet Determine
 a] The guide blade angle **b]** Speed of the turbine **c]** Vane angle of the runner at inlet **d]** Volume flowrate of turbine and **e]** Power developed.
[10 Marks]

17.
 a) What is cavitation? Explain its effects in centrifugal pump.
[05 Marks]
 b) Explain effect of friction in suction and delivery pipes on indicator diagram for reciprocating pump. **[05 Marks]**

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