Code No: 113BX

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD B.Tech II Year I Semester Examinations, April/May - 2018 FLUID MECHANICS AND HYDRAULIC MACHINERY (Electrical and Electronics Engineering)

Time: 3 Hours

Max. Marks: 75

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Note: This question paper contains two parts A and B.Part A is compulsory which carries 25 marks. Answer all questions in Part A.Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

		(25 Marks)
1.a)	State hydrostatic law and derive the expression for the same.	[2]
b)	Give examples of laminar flow, turbulent flow, steady flow, unsteady flow, un	niform flow
	and Non-uniform flow.	[3]
c)	State the momentum equation.	[2]
d)	Define the various coefficients of orifice.	[3]
e)	A jet of water 80 mm diameter having a velocity of 20 m/s strikes normally a	vertical flat
	plate. Find the force exerted by the jet.	[2]
f)	What is mass curve?	[3]
g)	List the factor which facilitate onset of cavitation.	[2]
h)	What do you understand by governing of hydraulic turbines? Explain with sl	ketches the
	working of an oil pressure governor.	[3]
i)	State the advantages of centrifugal pump over displacement pump.	[2]
j)	Explain briefly the following: (i) Manometric efficiency (ii) Volumetric	efficiency
	(iii) Mechanical efficiency, and (iv) Overall efficiency.	[3]

PART - B

(50 Marks)

- 2.a) Differentiate between U-tube differential manometer and inverted U-tube differential manometer.
- b) Distinguish between a path line and a streak line. [5+5]

OR

- 3.a) Two pressure points in a water pipe are connected to a manometer which has the form of an inverted U-tube. The space above the water in the two limbs of the manometers is filled with toluene of specific gravity 0.875. If the difference of level of water columns in the two limbs is equal to 0.12 m, what is the corresponding difference of pressure expressed in a) $Kg(f)/cm^2$; b) N/m².
 - b) Derive an expression for equation of continuity for 1D flow. [5+5]
- 4.a) State the Bernoulli equation. List out the assumptions and limitations of Bernoulli's equation. How is it modified while applying in practice? List out its engineering applications.
 - b) What is a mouthpiece? What is the advantage of providing a mouthpiece? [5+5]

OR

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- 5.a) Why are the pipes connected in a parallel?
- b) A pipeline ABC 180 m long is laid on an upward slope of 1 in 60. The length of the portion AB is 90 m and its diameter is 0.15 m. At B the pipe section suddenly enlarges to 0.30 m diameter and remains so far the reminder of its length BC, 90 m. A flow of 50 liters per second is pumped into the pipe at its lower end A and is discharged at the upper end C into a closed tank. The pressure at the supply end A is 137.34kN/m². Sketch (i) the total energy line, (ii) the hydraulic grade line and also find the pressure at discharge end C. Take f=0.02. [5+5]
- 6.a) A 30 mm diameter jet strikes without shock on a series of vanes. The jet velocity is 60 m/s and the vanes move in the same direction as the jet. The shape of each vane is such that, when stationary, it would deflect the jet through an angle of 150° . The friction reduces the relative velocity by 10% as water flows across the vanes and there is a further windage loss given by $\frac{u^2}{2}$ Nm/kg of water, where u is the vane speed. Determine:

i) The velocity of vanes corresponding to maximum efficiency; and

ii) The corresponding thrust on the vanes in the direction of motion.

b) Analyze the case of a jet striking a fixed symmetric semi circular plate at one of the tips and derive the required equations to find the impact. [5+5]

OR

- 7.a) Derive an expression for force exerted by the jet on a stationary vertical plate.
- b) A 12 cm diameter jet of water with a velocity of 15 m/s strikes a plate normally. If the plate is moving with a velocity of 5 m/s in the direction of jet, find (i) The force on the plate, (ii) The rate of work done and (iii) The efficiency of the jet. [5+5]
- 8.a) State the advantages and disadvantages of a Francis turbine over a Pelton wheel.
- b) What are the characteristic curves of a hydraulic turbine? How are small scale models useful in obtaining these curves for a proposed turbine of a hydroelectric installation?

[5+5]

OR

- 9.a) What are the effects of Cavitation? Give the necessary precautions against Cavitation.
- b) How do the losses in the draft tube effect the pressure at runner exit? [5+5]
- 10.a) What is the significance of characteristic curves?
 - b) A centrifugal pump is delivering 0.04 m³ of water per second to a height of 20 m through a 150 mm diameter 100m long pipeline. If the inlet losses in suction pipe are equal to 0.33m and friction factor 0.06 for the pipe-line, find the power required to drive the pump. Assume overall efficiency of the pump as 70 percent. [5+5]

OR

- 11.a) Derive an expression for the minimum speed for starting a centrifugal pump.
 - b) What do you meant by Net positive suction head (NPSH)? [5+5]

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