Q. Code: 975115

Reg. No. | | | | | | | | | | | | | |

B.E / B.TECH. DEGREE EXAMINATION, MAY 2023

Third Semester

MR18301 – MARINE HYDRAULICS AND FLUID MACHINERY

(Marine Engineering)

(Regulation 2018A)

TIME: 3 HOURS **MAX. MARKS: 100**

CO 1 Students can use their knowledge to select the suitable fluid pressure measuring instruments and they can use the knowledge of stability of ships in real time application.

CO 2 Students will have the Ability to analyze fluid flow problems and they can be able to use various flow measurements instruments in marine related application.

CO 3 Students can Apply fundamental principles and equations of fluid mechanics for the solution of practical marine engineering problems of water conveyance in pipes, pipe networks, and immerged bodies

CO 4 Students can apply fundamental knowledge of mathematics to modeling and dimensional analysis of fluid flow problems in marine engineering and they will be able to choose the appropriate pump for corresponding application.

CO 5 Students can Perform design calculations for turbine, and they will use their knowledge to select the suitable turbine for suitable requirements.

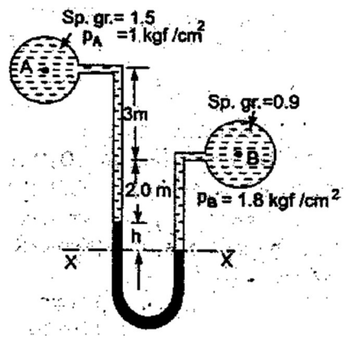
PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	How does the temperature affect the viscosity of gas molecules?	**1**	**2**
2.	How does metacentric height affect the stability of a ship?	**1**	**2**
3.	Differentiate between Eulerian and Lagrangian methods of representing fluid flow.	**2**	**2**
4.	List any three applications of the Bernoulli equation.	**2**	**1**
5.	Explain the role of friction in transferring the fluid through the pipe.	**3**	**2**
6.	List out the different minor losses.	**3**	**1**
7.	Compare the volute and vortex casing of the centrifugal pump.	**4**	**2**
8.	How does the cavitation affect the pump performance?	**4**	**2**
9.	Compare impulse and reaction turbine.	**5**	**2**
10.	What is the significance of draft tube in reaction turbine?	**5**	**2**

PART- B (5 x 14 = 70 Marks)

			Marks	CO	RBT LEVEL
11. (a)	**(i)**	Explain any one temperature-measuring device with a neat sketch.	**(6)**	**1**	**3**
	(ii)	A differential manometer is connected at the two points A and B of two pipes as shown in the figure. Pipe A contains a liquid of specific gravity of 1.5 while Pipe B contains a liquid of specific gravity of 0.9. The pressure at A and B are 1 kgf /cm^2 and 1.8 kgf/cm^2 respectively. Find the difference in the mercury level in the differential manometer.	**(8)**	**1**	**3**



(OR)

(b)		Explain the stability of the submerged body and floating body with neat sketch.	**(14)**	**1**	**3**
12. (a)	**(i)**	A horizontal venturi meter with inlet and throat diameters of 20cm and 10cm respectively is used to measure the flow of oil of specific gravity of 0.8. The discharge of oil through the venturi meter is 60 litres/s. Find the reading of the oil-mercury differential manometer. Take Cd=0.98	**(8)**	**2**	**3**
	(ii)	Compare 1. laminar and turbulent flow. 2. Steady and uniform flow.	**(6)**	**2**	**3**

(OR)

(b)		Derive the expression for Bernoulli's equation and write down the assumption to derive the expression	**(14)**	**2**	**3**

13. (a)	What is the boundary layer? What is the effect of the boundary layer on the flow? Sketch and explain the various regions of the boundary layer over the flat plate.	**(14)**	**3**	**3**
	(OR)			
(b)	A main pipe divides into two parallel pipes which again form one pipe. The length and diameter for the first parallel pipe are 2000m and 1m respectively, while the length and diameter of 2nd parallel pipe are 2000m and 0.8m. Find the rate of flow in each parallel pipe, if the total flow in the main is 3.0 m^3/s. The coefficient of friction for all pipes is 0.005.	**(14)**	**3**	**3**
14. (a)	Derive on the basis of dimensional analysis suitable parameters to present the thrust force developed by a propeller. Assume that the thrust force P depends upon the angular velocity ω, speed of advance V, diameter D, dynamic viscosity μ, mass density ρ, elasticity of the fluid medium which can be denoted by the speed of sound in the medium C.	**(14)**	**4**	**3**
	(OR)			
(b)	A centrifugal pump having an outer diameter of 400mm and outlet width of 50mm, running at 800rpm. Works against a total head of 15m. The vanes angle at the outlet is 40 degrees and manometric efficiency is 75%. Find 1. Velocity of the flow at outlet 2. Velocity of water leaving 3. Discharge, 4. Angle made by the absolute velocity at the outlet.	**(14)**	**4**	**3**
15. (a)	A Pelton wheel has a mean bucket speed of 10m/s with a jet of water flowing at the rate of 700 litres/s under a head of 30m. The buckets deflect the jet through an angle of 160 degrees. Calculate the power by water to the runner and the hydraulic efficiency of the turbine. Assume the co-efficient of velocity as 0.98.	**(14)**	**5**	**3**
	(OR)			
(b)	Sketch and explain the construction and working principle of the Kaplan turbine	**(14)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	A solid cylinder of 15 cm diameter and 60 cm long, consists of two parts made of different materials. The first part at the base is 1.20 cm long and of specific gravity = 5.0. The other parts of the cylinder is made of the material having specific gravity 0.6. State, if it can float vertically in water.	**(10)**	**1**	**3**