Morning.
D: 28/05/2014.

Student Exam No._____

GANPAT UNIVERSITY
B.TECH 4th SEM. MARINE ENGINEERING
REGULAR EXAMINATION MAY/JUNE-2014
FLUID MECHANICS& HYDRAULICS (2MR 407)

TIME:-3 Hours   TOTAL MARKS-70

INSTRUCTIONS: (1) Attempt all questions.
(2) Figure to the right indicates full marks.
(3) Assume required data if necessary.

SECTION-1

Q-1	**Answer the following questions.**	**[12]**
(a)	Define: (i) Viscosity (ii) Specific gravity (iii) Weight density (iv) Kinematic viscosity (v) Ideal fluid (vi) Newtonian fluid.	06
(b)	Derive the equation for velocity of sound in terms of bulk modulus.	06

OR

Q-1	**Answer the following questions.**	**[12]**
(a)	Calculate the capillary rise in a glass tube of 3.0 mm diameter when immersed vertically in (i) water and (ii) mercury. Take surface tensions for mercury and water as 0.0725 N/m and 0.52 N/m respectively in contact with air. Sp. Gr. Of mercury is given as 13.6.	
(b)	Explain the phenomenon of surface tension with neat sketch. Prove that the relationship between surface tension and pressure inside a droplet of liquid in excess of outside pressure is given by, $p = \frac{4\sigma}{d}$.	

Q-2	**Answer the following questions.**	**[11]**
(a)	With neat sketches explain the conditions of equilibrium for floating and submerged bodies.	05
(b)	State and prove Pascal's law.	06

OR

Q-2	**Answer the following questions.**	**[11]**
(a)	State and prove Hydrostatic law.	06
(b)	A simple manometer is used to measure the pressure of oil of sp. Gr. 0.8 flowing in a pipe line. Its right limb is open to the atmosphere and left limb is connected to the pipe. The centre of the pipe is 9 cm below the level of mercury of sp. Gr. 13.6 in the right limb. If the difference of mercury level in the two limbs is 15 cm, determine the absolute pressure of the oil in the pipe in N/cm².	05

Q-3	**Answer the following questions.**	**[12]**
(a)	Define Venturimeter. Derive an expression for discharge through Venturimeter.	06
(b)	Derive the Euler's equation of motion. Also derive the Bernoulli's equation.	06

Q-4 **Answer the following questions.** [12]

(a) Derive an expression for the force exerted by a jet of water on inclined moving plate. 06

(b) Derive an expression for work done by jet of water on unsymmetrical moving curved plate when jet strikes tangentially at the end of the tip. 06

OR

Q-4 **Answer the following questions.** [12]

(a) Show that the efficiency of a free jet striking normally on a series of flat plate mounted on the periphery of a wheel can never exceed 50%. 06

(b) A 7.5 cm diameter jet having a velocity of 30 m/s strikes a flat plate, the normal of which is inclined at 45^0 to the axis of the jet. Find the normal force on the plate when (i) the plate is stationary and (ii) the plate is moving with a velocity of 15 m/s and away from the jet. Also determine the power and efficiency of the jet when the plate is moving. 06

Q-5 **Answer the following questions.** [11]

(a) Give the classification of hydraulic turbines. 06

(b) A pelton wheel is to be designed for the following specifications. Shaft power = 11772 kW, Head = 380 m, Speed = 750 r.p.m, Overall efficiency= 86%, Jet diameter is not exceed to one-sixth of the wheel diameter. Determine: (1) The wheel diameter (2) The number of jet required (3) Diameter of the jet. Take, K_{v1}=0.985, K_{u1}=0.45. 05

OR

Q-5 **Answer the following questions.** [11]

(a) Differentiate between impulse and reaction turbines. 06

(b) Define following terms related to the hydraulic turbine. 05
(i) Gross head (ii) Friction head (iii) Hydraulic efficiency (iv) Volumetric efficiency (v) Mechanical efficiency.

Q-6 **Answer the following questions.** [12]

(a) What is draft tube? Define NPSH. 2

(b) Define specific speed of a centrifugal pump. Derive an expression for same. 5

(c) Define cavitation? Write short note on main parts of a centrifugal pump. 5

END OF PAPER