

II B. Tech II Semester Regular Examinations, August/September - 2021
FLUID MECHANICS & HYDRAULIC MACHINES
(Mechanical Engineering)

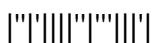
Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks

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- 1 a) A U-tube manometer is used to measure the pressure of oil of specific gravity 0.85 flowing in a pipe line. Its left end is connected to the pipe and the right limb is open to the atmosphere. The centre of the pipe is open to the atmosphere. The centre of the pipe is 100mm below the level of mercury (specific gravity=13.6) in the right limb. If the difference of mercury level in the two limbs is 160mm, determine the absolute pressure of the oil in the pipe. 8M
- b) Show that the rate of increase of pressure in a vertical direction in a fluid at rest is equal to the weight density of the fluid at that point. 7M
- Or
- 2 a) A Stone weighs 482.6 N in air and 206.4 N in water Compute volume of stone and its specific gravity. 7M
- b) Explain the working of Micro manometers with neat sketch. 8M
- 3 a) Define the equation of continuity. Obtain the expression for continuity equation in three dimensions? 7M
- b) The water is flowing through a taper pipe of length 100m having diameters 600mm at the upper end and 300mm at the lower end at the rate of 50lit/s. The pipe has a slope of 1 in 30. Find the pressure at the lower end if the pressure at the higher level is  $19.62\text{N/cm}^2$ . 8M
- Or
- 4 a) What is the significance of Reynolds's experiment? Explain how Reynolds's experiment is conducted. 8M
- b) List out the minor losses in closed conduit flow and discuss their significance. 7M
- 5 a) Discuss the following 8M  
(i)The concept of the boundary layer with reference to fluid motion over a flat plate. (ii) Phenomenon of separation for flow over curved surfaces. (iii) The prevention of separation.
- b) Explain Boundary layer separation with a neat sketch. What are the conditions under which separation takes place? 7M
- Or
- 6 a) The efficiency  $\eta$  of a fan depends on density „ $\rho$ “, dynamic viscosity „ $\mu$ “, and angular velocity „ $\omega$ “, diameter D of the rotor and the discharge Q. Evaluate  $\eta$  in terms of dimensionless parameters using Buckingham's  $\pi$  method. 8M
- b) Define physically and mathematically the concept of displacement, momentum and energy thickness of a boundary layer. 7M



- 7 a) What is the importance of a draft tube in a Francis turbine? Discuss different types of draft tubes. 7M
- b) A turbine is to operate under a head of 25 meters at 200 rpm. The discharge is  $9 \text{ m}^3/\text{sec}$ . If the turbine efficiency is 90% determine: (i) specific speed of the turbine (ii) power generated (iii) performance under a head of 20 meters. Also state the type of the turbine. 8M

Or

- 8 a) What is a draft-tube? Why is it used in a reaction turbine? Describe with neat sketch two different types of draft tubes. 7M
- b) A 150mm diameter jet moving at 30m/s impinges on a curved vane moving at 15m/s in the direction of the jet. The jet leaves the vanes at  $60^\circ$  with the direction of motion of the vanes. Calculate: (i) Force exerted by the jet in the direction of motion of vanes (ii) Work done by the jet per second. 8M
- 9 a) Draw and discuss characteristic curves of a pump. 7M
- b) The cylinder bore diameter of a single acting reciprocating pump is 150 mm and its stroke length is 300 mm. The pump runs at 50 rpm and lifts water through a height of 25m. The delivery pipe is 22 m long and 100mm in diameter. Find the theoretical discharge. If the actual discharge is 4.2 liters/s, find the % Slip. 8M

Or

- 10 a) What are pump troubles and remedies? Explain. 7M
- b) The internal and external diameters of the impeller of a centrifugal pump are 200 mm and 400 mm respectively. The pump is running at 1200 r.p.m. The vane angles of the impeller at inlet and outlet are  $20^\circ$  and  $30^\circ$  respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water. 8M

