

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

B.Tech. II Year II Semester Supplementary Examinations December-2025

FLUID MECHANICS & HYDRAULIC MACHINES

(Mechanical Engineering)

Time: 3 Hours

Max. Marks: 70

PART-A

(Answer all the Questions 10 x 2 = 20 Marks)

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|---|---|---|-----|----|----|
| 1 | a | Define the term weight density. | CO1 | L1 | 2M |
| | b | Explain the term meta-centre. | CO1 | L2 | 2M |
| | c | Distinguish between steady flow and un-steady flow. | CO2 | L4 | 2M |
| | d | Describe Venturimeter and Orificemeter. | CO2 | L1 | 2M |
| | e | Explain the terms Drag and Lift. | CO3 | L2 | 2M |
| | f | What is Dimensional homogeneity. | CO4 | L3 | 2M |
| | g | Define the terms, Unit Speed and Unit Head.. | CO5 | L1 | 2M |
| | h | Explain about Hydraulic Efficiency and Mechanical Efficiency. | CO5 | L2 | 2M |
| | i | Differentiate between Radial and axial flow turbine. | CO6 | L2 | 2M |
| | j | Define cavitation and water hammer. | CO6 | L1 | 2M |

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

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|---|---|--|-----|----|----|
| 2 | a | List out different types of manometers. Explain about piezometer in detail | CO1 | L1 | 4M |
| | b | An inverted U – tube manometer is connected to two horizontal pipes A and B through which water is flowing. The vertical distance between the axes of these pipes is 30cm. When an oil of specific gravity 0.8 is used as a gauge fluid, the vertical heights of water columns in the two limbs of the inverted manometer (when measured from the respective center lines of the pipes) are found to be same and equal to 35 cm. Determine the difference of pressure between the pipes. | CO1 | L3 | 6M |

OR

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|---|--|---|-----|----|-----|
| 3 | | A solid cylinder of 10cm diameter and 40 cm long. Consists of two parts made of different materials. The first part of the base is 1.0 cm long and of specific gravity 6.0. The other part of the cylinder is made of the material having specific gravity 0.6. State, if it can float vertically in water. | CO1 | L3 | 10M |
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UNIT-II

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|---|---|--|-----|----|----|
| 4 | a | What is a pitot tube? How will you determine the velocity at any point with the help of pitot tube? | CO2 | L2 | 5M |
| | b | A sub-marine moves horizontally on a sea and has its axis 15m below the surface of water. A pitot tube properly placed just in front of a sub-marine and along its axis is connected to two limbs of a u – tube containing mercury. The difference of mercury level is found to be 170mm. Determine the speed of the sub-marine knowing that the specific gravity of mercury is 13.6 and that of sea water is 1.026 with respect of fresh water. | CO2 | L5 | 5M |

OR

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| 5 | | A main pipe divides into two parallel pipes which again forms one pipe as shown in figure. Above the length & dia for the first parallel pipe are 2000m & 1.0m respectively. While the length & dia of 2 nd parallel pipe are 2000m & 0.8m. Calculate the rate of flow in each parallel pipe if total flow in the main is 3.0 m ³ /s. the coefficient of friction for each parallel pipe is same & equal to 0.005? | CO2 | L3 | 10M |
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UNIT-III

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| 6 | | A thin plate is moving in still atmospheric air at a velocity of 5m/s. the length of the plate is 0.6m and width 0.5 m. Calculate
(i) the thickness of the boundary layer at the end of the plate and
(ii) drag force on one side of the plate.
Take density of air as 1.24kg/m ³ and kinetic viscosity 0.15 stokes. | CO3 | L3 |
|---|--|--|-----|----|

OR

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| 7 | | Determine the dimensions of the quantities given below
(i) angular velocity
(ii) angular acceleration
(iii) discharge
(iv) Kinematic Viscosity
(v) Force,
(vi) Dynamic Viscosity | CO4 | L5 |
|---|--|--|-----|----|

UNIT-IV

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|---|--|---|-----|----|
| 8 | | A nozzle of 50 mm diameter delivers a stream of water at 20m/s perpendicular to a plate that moves away from the jet at 5m/s Find :
(i) the force on the plate
(ii) the work done
(iii) the efficiency of jet. | CO5 | L2 |
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OR

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| 9 | | A Francis turbine with an overall efficiency of 75% is required to produce 148.25KW. It is working under a head of 7.62 m. The peripheral velocity = $0.26\sqrt{2gH}$ and the radial velocity of the flow at inlet is $0.96\sqrt{2gH}$. The wheel runs at 150 rpm and the hydraulic losses in the turbine are 22% of the available energy. Assume radial discharge. determine. i) guide blade angle, ii) wheel vane angle at inlet, iii) diameter of wheel at inlet and iv) width of wheel at inlet | CO5 | L5 |
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UNIT-V

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| 10 | a | Describe the governing mechanisms employed in hydraulic turbines. How do these mechanisms regulate the speed and output of the turbine? | CO6 | L5 |
| | b | Define and explain hydraulic efficiency, mechanical efficiency and overall efficiency. | CO6 | L2 |
| 11 | | A single-acting reciprocating pump, running at 50 r.p.m., delivers 0.01 m ³ /s of water. The diameter of the piston is 200 mm and stroke length is 400 mm. Determine: (i) Theoretical discharge of the pump, (ii) Co-efficient of discharge and (iii) Slip and the percentage slip of the pump. | CO6 | L5 |

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