

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

B.Tech. II Year II Semester Regular & Supplementary Examinations March/April-2026
HYDRAULICS & HYDRAULIC MACHINERY
(Civil 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 laminar flow and what is the value of Reynolds number. | CO1 | L1 | 2M |
| b | Differentiate smooth and rough pipe. | CO1 | L2 | 2M |
| c | What is open channel flow? | CO2 | L1 | 2M |
| d | State the conditions for most economical trapezoidal section. | CO2 | L1 | 2M |
| e | Calculate critical depth of a rectangular channel having discharge per unit width is 3cumecs/m. | CO3 | L4 | 2M |
| f | List the methods to dissipate the energy of flowing water. | CO3 | L2 | 2M |
| g | Calculate the force exerted by the jet on a stationary flat plate held normal to the jet having area of 2 sq.m with a velocity of 3 m/s. | CO5 | L4 | 2M |
| h | Define turbine. | CO5 | L1 | 2M |
| i | State the purpose of priming. | CO6 | L1 | 2M |
| j | Define cavitation. | CO6 | L1 | 2M |

PART-B

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

UNIT-I

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|---|---|-----|----|-----|
| 2 | Derive an expression for laminar flow through circular pipes. | CO1 | L2 | 10M |
|---|---|-----|----|-----|

OR

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|-----|--|-----|----|----|
| 3 a | Describe briefly any two methods of determining the coefficient of viscosity of a liquid. | CO1 | L1 | 5M |
| b | A liquid with a specific gravity 2.8 and a viscosity 0.8 poise flows through a smooth pipe of unknown diameter, resulting in a pressure drop of 800 N/m ² in 2 km length of the pipe. What is the pipe diameter if the mass flow rate is 2500 kg/h. | CO1 | L4 | 5M |

UNIT-II

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|-----|---|-----|----|----|
| 4 a | Classify various types of flow in channels and explain. | CO2 | L2 | 5M |
| b | Find the discharge of water through the circular channel of diameter of 1.2 m. Take the value of C = 60 and slope of the bed as 1 in 950. | CO2 | L4 | 5M |

OR

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|-----|--|-----|----|----|
| 5 a | Derive an expression for velocity of flow through open channel using Chezy's equation. | CO2 | L2 | 5M |
| b | Derive the conditions to be most economical rectangular channel section. | CO2 | L2 | 5M |

UNIT-III

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|-----|---|-----|----|----|
| 6 a | A 8 m wide channel conveys 15 m ³ /s of water at a depth of 1.2 m. Calculate specific energy of the flowing water, critical depth, critical velocity and minimum specific energy. State whether the flow is subcritical or supercritical based on Froude number. | CO3 | L4 | 5M |
| b | The specific energy for a 3 m wide channel is to be 3 Nm/N. What would be the maximum possible discharge. | CO3 | L4 | 5M |

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|-----|--|-----|----|----|
| 7 a | Define specific force, specific depth and critical depth. | CO4 | L1 | 6M |
| b | In a rectangular channel of 0.5 m width, a hydraulic jump occurs at a point where depth of water flow is 0.15 m and Froude number is 2.5. Determine specific energy, critical and subsequent depths, loss of head and Energy dissipated. | CO4 | L4 | 4M |

UNIT-IV

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|-----|---|-----|----|----|
| 8 a | A jet of water 75 mm diameter issues with a velocity of 30 m/s and impinges on a stationary flat plate which destroys its forward motion. Find the force exerted by the jet on the plate and work done. | CO5 | L4 | 5M |
| b | Derive an expression for force exerted on a stationary flat plate held inclined to the jet. | CO5 | L2 | 5M |

OR

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|-----|--|-----|----|----|
| 9 a | Classify turbines. | CO5 | L4 | 5M |
| b | Explain construction and working of Pelton Wheel with a neat sketch. | CO5 | L1 | 5M |

UNIT-V

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|------|--|-----|----|----|
| 10 a | A centrifugal pump rotating at 1500 rpm delivers 0.2 cumec at a head of 15 m. Calculate the specific speed and the power. Assume overall efficiency of the pump as 0.68. If this pump were to operate at 900 rpm, what would be the head, discharge and power required for homologous condition. | CO6 | L4 | 5M |
| b | Define Net Positive Suction Head (NPHS) with a neat sketch and explain cavitation and its effects. | CO6 | L1 | 5M |

OR

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|------|--|-----|----|----|
| 11 a | A centrifugal pump is to discharge 0.118 cumec at a speed of 1450 rpm against a head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. | CO6 | L4 | 5M |
| b | List operational difficulties in centrifugal pumps. | CO6 | L1 | 5M |

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