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

B.Tech II Year I Semester Supplementary Examinations December-2021
FLUID MECHANICS & FLUID MACHINES
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 60

PART-A

(Answer all the Questions 5 x 2 = 10 Marks)

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|----------|----------|--|-----------|
| 1 | a | Define Gauge pressure. | 2M |
| | b | What is free vortex and forced vortex flow. | 2M |
| | c | Derive the expression for Reynold's number. | 2M |
| | d | State the Buckingham's pi- theorem. | 2M |
| | e | Define gross head and net or effective head. | 2M |

PART-B

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

UNIT-I

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|----------|----------|---|-----------|
| 2 | a | Determine the bulk modulus & compressibility of elasticity of a liquid. If the pressure of liquid is increased from 70 N/cm ² to 180 N/cm ² . The volume of liquid decreases 0.15%. | 5M |
| | b | Differentiate kinematic viscosity and dynamic viscosity. Give their dimensions | 5M |

OR

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|----------|----------|---|-----------|
| 3 | a | What do you mean by single column manometer? How are they used for the measurement of pressure? | 5M |
| | b | What is the gauge pressure at a point 3m below the free surface of a liquid having a density 1.53 x 10 ³ kg/m ³ , if the atmospheric pressure is equivalent to 750 mm of mercury, the Specific gravity of mercury is 13.6 and density of water = 1000 kg/m ³ ? | 5M |

UNIT-II

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| 4 | a | Define the terms: Stream line, streak line, path line, stream tube and control volume. | 5M |
| | b | Obtain an expression for continuity equation for three - dimensional flow. | 5M |

OR

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|----------|----------|---|-----------|
| 5 | a | Derive impulse momentum equation. | 3M |
| | b | A 300 mm diameter pipe carries water under a head of 20 m with a velocity of 3.5 m/s. If the axis of the pipe turns through 45°, find the magnitude and direction of the resultant force at the bend. | 7M |

UNIT-III

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|----------|----------|--|-----------|
| 6 | a | Derive the expression for head loss in pipes due to friction by using Darcy-Weisbach equation | 5M |
| | b | The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300 m, 170 m, 210 m and of diameters 300 mm, 200 mm, 400 mm respectively, is 12 m. Determine the rate of flow of water if co-efficient of friction are 0.005, 0.0052 and 0.0048 respectively, considering the minor losses. | 5M |

OR

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|----------|----------|---|-----------|
| 7 | a | A horizontal venture meter with 30cm diameter inlet and 10cm throat is used for measuring the flow of water through a pipeline. If pressure in pipe is 1.5kpa and the vacuum pressure at the throat is 40cm of mercury, calculate the rate of flow. It may be presumed that 5% of differential head is lost between the pipe main and the throat section. Also make calculations for the discharge co-efficient take specific weight of water = 10kN/m ³ . | 6M |
| | b | Explain pitot tube and pitot static tube. | 4M |

UNIT-IV

- 8 a Water is flowing through a pipe of diameter 30 cm at a velocity of 4 m/s. Find the velocity of oil flowing in another pipe of diameter 10 cm, if the condition of dynamic similarity is satisfied between the two pipes. The viscosity of water and oil is given as 0.01 poise and 0.025 poise. Take sp.gr. of oil =0.8 **6M**
- b Write a short note on model laws. **4M**

OR

- 9 a In a model, test of a spillway the discharge and velocity of flow over the model were 2 m³/s and 1.5 m/s respectively. Calculate the velocity and discharge over the prototype, which is 36 Times the model size. **5M**
- b The time period (t) of a pendulum depends upon the length (l) of the pendulum and acceleration due to gravity (g). Derive expression for time period. **5M**

UNIT-V

- 10 a Derive the expression for velocity triangles and work done for Pelton wheel. **5M**
- b A Francis turbine with an overall efficiency of 75 % is required to produce 148.25 kW power. It is working under a head of 7.62m. The peripheral velocity = $0.26\sqrt{2gh}$ and the radial velocity of flow at inlet is $0.96\sqrt{2gh}$. The wheel runs at 150 r.p.m. and the hydraulic losses in the turbine are 22% of the available energy. Assuming radial discharge, determine: i) The guide blade angle ii) The wheel vane angle at inlet **5M**

OR

- 11 a Write a note on work done by the centrifugal pump (impeller) on water. **5M**
- b A centrifugal pump delivers water against a net head of 14.5m and a design speed of 1000 r.p.m. The vanes of curved back to an angle of 30° with the periphery. The impeller diameter is 300mm and outlet width is 50mm. Determine the discharge of the pump if manometric efficiency is 95%. **5M**

END