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

B.Tech II Year I Semester Supplementary Examinations November-2020

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 | What is surface tension? | 2M |
| | b | Define stream function. | 2M |
| | c | List the minor energy losses in pipes? | 2M |
| | d | Define dimensional homogeneity. | 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 | Define and mention units for the following fluid properties: Density, specific weight, specific volume and specific gravity of a fluid. | 5M |
| | b | Define surface tension. Derive the relationship between surface tension and pressure inside a droplet of liquid in excess of outside pressure. | 5M |

OR

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|----------|----------|--|-----------|
| 3 | a | Explain the phenomenon of capillarity. Obtain an expression for capillary rise of a liquid. | 5M |
| | 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 b. | 5M |

UNIT-II

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|----------|----------|--|-----------|
| 4 | a | Define local acceleration, convective acceleration and tangential acceleration. | 5M |
| | b | A 30 cm diameter pipe, conveying water, branches into two pipes of diameters 20 cm and 15 cm respectively. If the average velocity in the 30 cm diameter pipe is 2.5 m/s. Find the discharge in the pipe. Also determine the velocity in 15 cm pipe if the average velocity in 20 cm diameter pipe is 2 m/s. | 5M |

OR

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|----------|----------|--|-----------|
| 5 | a | Derive Euler's equation of motion | 5M |
| | b | Define the following terms: Velocity potential function, stream function, equipotential line and flow net. | 5M |

UNIT-III

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| 6 | Derive the expression for head loss in pipes due to friction by using Darcy-Weisbach equation. | 10M |
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OR

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| 7 | 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 (i) minor losses also (ii) Neglecting minor losses. | 10M |
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UNIT-IV

- 8 a** Describe briefly Buckingham's pi- theorem **5M**
b A pipe of diameter 1.5 m is required to transport an oil of sp.gr 0.90 and viscosity 3×10^{-2} poise at the rate of 3000 liters /s. Tests were conducted on a 15 cm diameter pipe using water at 20° C. Find the velocity and the rate of flow in the model. Viscosity of water at 20° C is equal to 0.01 poise. **5M**

OR

- 9 a** Describe Froude model law and scale ratios briefly **5M**
b 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. **5M**

UNIT-V

- 10 a** What is Pelton turbine? Discuss the parts of Pelton turbine **5M**
b Write a note on work done by the centrifugal pump (impeller) on water **5M**

OR

- 11** 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: a) The guide blade angle b) The wheel vane angle at inletc) Diameter of the wheel at inletd) Width of the wheel at inlet. **10M**

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