**20ME305**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular) DEGREE EXAMINATION** | | | |
| **March, 2022** | **Mechanical Engineering** | | |
| **Third Semester** | **Fluid Mechanics and Hydraulic Machines** | | |
| **Time:** Three Hours | | **Maximum:7**0 Marks | |
| *Answer Question No.1 compulsorily.* | | | (14X1 = 14 Marks) |
| *Answer ONE question from each unit.* | | | (4X14=56 Marks) |
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| 1. | a) | | Define surface tension. | CO1 |  |
|  | b) | | Define Meta centric height. | CO1 |  |
|  | c) | | Explain about stream line in a fluid flow | CO1 |  |
|  | d) | | What are the assumptions taken in deriving the Bernoulli’s equation? | CO2 |  |
|  | e) | | List the various losses in pipes. | CO2 |  |
|  | f) | | What is water hammer? | CO2 |  |
|  | g) | | Define impact of jet. | CO3 |  |
|  | h) | | Define specific speed of a turbine. | CO3 |  |
|  | i) | | What is a draft tube? | CO3 |  |
|  | j) | | Define unit discharge. | CO3 |  |
|  | k) | | Define slip and percentage slip of a reciprocating pump | CO4 |  |
|  | l) | | What is the use of air vessel in reciprocating pump? | CO4 |  |
|  | m) | | List the differences between Reciprocating and Centrifugal pump | CO4 |  |
|  | n) | | What are the effects of cavitation? | CO4 |  |
| **Unit - I** | | | | | |
| 2. | a) | Define and discuss the following fluid properties (i) Specific weight (ii) Specific gravity (iii) Viscosity (iv) Vapor pressure | | CO1 | 7M |
|  | b) | A simple manometer (U-tube) is used to measure the pressure of oil (sp.gr=0.8) flowing in a pipeline. Its right limb is open to atmosphere and left limb is connected to the pipe. The center of the pipe is 9 cm below the level of mercury (sp.gr 13.6) in the right limb. If the difference of mercury level in the two limbs is 15 cm, determine the absolute pressure of the oil in the pipe in N/cm2. | | CO1 | 7M |
| **(OR)** | | | | | |
| 3. | a) | A rectangular plane surface is 2 m wide and 3 m deep. It lies in vertical plane in water. Determine the total pressure and position of center of pressure on the plane surface when its upper edge is horizontal and coincides with water surface. | | CO1 | 7M |
|  | b) | Briefly explain the following.   1. Velocity potential and stream function. 2. Steady and unsteady flows. 3. Uniform and non-uniform flows. 4. Rotational and irrotational flows. | | CO1 | 7M |
| **Unit - II** | | | | | |
| 4. | a) | What is the working principle of Venturimeter? Also describe with the help of sketch the construction, operation and use of Venturimeter, | | CO2 | 7M |
|  | 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. | | CO2 | 7M |
| **(OR)** | | | | | |
| 5. | a) | Derive Darcy Weisbach equation for head loss due to friction in pipe. | | CO2 | 7M |
|  | b) | Find the loss of head when a pipe diameter 200 mm is suddenly enlarged to 400mm diameter. The rate of flow of water through the pipe is 250 lit/s. | | CO2 | 7M |
| **Unit - III** | | | | | |
| 6. | a) | Derive the equation for the impact of jet striking a symmetrical curved vane at the center when the plate is stationary. | | CO3 | 7M |
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|  | b) | A nozzle of 50 mm diameter delivers a stream of water at 20 m/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 the jet. | | CO3 | 7M |
| **(OR)** | | | | | |
| 7. | a) | Explain the working of a Pelton wheel with neat sketches? | | CO3 | 7M |
|  | b) | Kaplan turbine produces 80000 KW. under a head of 25 m with an overall efficiency of 90%. Taking the value of speed ratio as 1.6, flow ratio as 0.5 and the hub diameter as 0.35 times the outer diameter, find the diameter and speed of the turbine. | | CO3 | 7M |
| **Unit - IV** | | | | | |
| 8. | a) | Explain the working of reciprocating pump with neat sketch. | | CO4 | 7M |
|  | b) | A single acting reciprocating pump, running at 50 rpm delivers 0.01 m3/s of water. The diameter of the piston is 200 mm and stroke length 400 mm. Determine.   1. The theoretical discharge of the pump 2. Coefficient of Discharge 3. Slip and percentage slip of the pump. | | CO4 | 7M |
| **(OR)** | | | | | |
| 9. | a) | Explain the working of a single stage centrifugal pump with neat sketch. | | CO4 | 7M |
|  | b) | The diameters of an impeller of a centrifugal pump at inlet and outlet are 30 cm and 60 cm respectively. Determine the minimum starting speed of the pump if it works against a head of 30 m. | | CO4 | 7M |

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