**18ME304**

**Hall Ticket Number:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **II/IV B.Tech (Regular / Supplementary) DEGREE EXAMINATION** | | | |
| **February, 2021** | **Mechanical Engineering** | | |
| **Third Semester** | **Fluid Mechanics& Hydraulic Machines** | | |
| **Time:** Three Hours | | **Maximum :** 50 Marks | |
| *Answer ALL Questions from PART-A.* | | | (1X10 = 10 Marks) |
| *Answer* ***ANY FOUR*** *questions from PART-B.* | | | (4X10=40 Marks) |
| **Part-A** | | | |

**1.** Answer all questions (1X10=10 Marks)

|  |  |  |
| --- | --- | --- |
| a) | Define dynamic Viscosity. | |
| b) | State Pascal’s Law. | |
| c) | Define force of buoyancy. | |
| d) | What is the stream function? | |
| e) | Name any four minor energy losses in a fluid flow. | |
| f) | Write an expression for force exerted by jet on fixed inclined plate in the direction of jet. | |
| g) | Classify hydraulic turbines. | |
| h) | What is cavitation in turbines? | |
| i) | What is the function of air vessels reciprocating pump? | |
| j) | Define specific speed of a centrifugal pump. | |
|  | |  | |

**Part-B**

|  |  |  |
| --- | --- | --- |
| 2.a) | Explain the phenomenon of capillarity. Obtain an expression for capillary rise of a liquid. | 5 M |
| 2.b) | Determine total pressure on a circular plate of diameter 1.5 m which is placed vertically in water in such a way that the centre of the plate is 3 m below the free surface of water. Find the position of centre of pressure also. | 5 M |

|  |  |  |
| --- | --- | --- |
| 3.a) | Describe the following:   1. Newton’s law of viscosity 2. Hydrostatic law 3. Metacentric height 4. Vapor pressure | 4 M |
| 3.b) | Obtain an expression for continuity equation for three dimensional flow in its most general form. | 6 M |

|  |  |  |
| --- | --- | --- |
| 4.a) | Derive Bernoulli’s equation. | 5 M |
| 4.b) | A 20 cm x 10 cm venturimeter is inserted in a vertical pipe carrying oil of specific gravity 0.8; the flow of oil is in upward direction. The difference of the levels between the throat and inlet section is 50 cm. The oil mercury differential manometer gives a reading of 30 cm of mercury. Find the discharge of oil. Neglect losses. | 5 M |
| 5.a) | Find an expression for the power transmission through the pipes. What is the condition for maximum transmission of power and corresponding efficiency of transmission? | 5 M |
| 5.b) | Find the diameter of the pipe of length 2000 m when the rate of flow of water through the pipe is 200 lit/s and head lost due to friction is 4 m. Take the value of C= 50 in chezy’s formulae. | 5 M |

**P.T.O.**

**18ME304**

|  |  |  |
| --- | --- | --- |
| 6.a) | Derive the equation for the impact of jet on an inclined moving in the direction of jet. | 4 M |
| 6.b) | A jet of water of diameter 7.5 cm strikes a curved plate at its centre with a velocity of 20 m/s. The curved plate is moving with a velocity of 8 m/s in the direction of jet. The jet is deflected through an angle of 1650.Assuming plate is smooth find:   1. Force exerted on the plate in the direction of jet 2. Power of the jet 3. Efficiency of the jet | 6 M |
| 7.a) | A Pelton turbine develops 3000 kW under a head of 300 m. The overall efficiency of the turbine is 83%. If speed ratio = 0.46,Cv=0.98 and specific speed is 16.5, then find: (i) diameter of the turbine and (ii) diameter of the jet. | 6 M |
| 7.b) | Describe briefly the main components of Kaplan turbine with a neat sketch | 4 M |
| 8.a) | What is the principle of working of a reciprocating pump? Explain the working of reciprocating pump with neat sketch. | 6 M |
| 8.b) | A single acting reciprocating pump, running at 50 r.p.m., delivers 0.01 m3/s of water. The diameter of the piston is 200 mm and stroke length 400 mm. Determine :   1. Theoretical discharge of the pump 2. Slip of the pump. | 4 M |
| 9.a) | Define centrifugal pump. Explain the working of a single –stage centrifugal pump with sketches. | 6 M |
| 9.b) | What is the difference between single stage and multi stage pumps? Describe multi stage pump with (i) impellers in parallel and (ii) impellers in series. | 4 M |

