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**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_\_

**End Semester Examination – Nov/Dec - 2016**

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|  |  | **Semester:** | **2016-17 ODD** |
| **Code:** | **09CE242/12CE263/CE212** | **Duration:** | **3 hrs.** |
| **Sub. Name:** | **FLUID MECHANICS AND MACHINERY** | **Max. marks:** | **100** |

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| **Q. No.** | | **Questions** | | | **Marks** | | | | |
| **PART-A(10X1=10 MARKS)** | | | | | | | | | |
| 1. | | The specific weight of water is \_\_\_\_\_\_\_\_\_\_\_\_\_. | | | (1) | | | | |
| 2. | | What is surface tension? | | | (1) | | | | |
| 3. | | A line along which the velocity potential is constant is called \_\_\_\_\_\_\_\_\_\_\_\_\_. | | | (1) | | | | |
| 4. | | The flow of rotating mass of fluid is known as \_\_\_\_\_\_\_\_\_\_\_\_\_. | | | (1) | | | | |
| 5. | | If the jet after contraction expands and fills the whole mouthpiece it is known as \_\_\_\_\_\_\_\_\_\_\_\_\_. | | | (1) | | | | |
| 6. | | What is a notch? | | | (1) | | | | |
| 7. | | Define slip. | | | (1) | | | | |
| 8. | | What is cavitation? | | | (1) | | | | |
| 9. | | Define mechanical efficiency of a turbine. | | | (1) | | | | |
| 10. | | Give an example of positive displacement pump. | | | (1) | | | | |
| **PART B(5 X 3= 15 MARKS)** | | | | | | | | |
| 11. | | Explain Newton's Law of Viscosity. | | (3) | | | | |
| 12. | | Distinguish between steady flow and unsteady flow | | (3) | | | | |
| 13. | | Find the discharge from a 100-mm diameter external mouthpiece, fitted to a side of a large vessel if the head over the mouthpiece is 4 m. | | (3) | | | | |
| 14. | | Find the force exerted by a jet of water of diameter 75 mm on a stationary flat plate, when the jet strikes the plate normally with velocity of 20 m/s. | | (3) | | | | |
| 15. | | Write short note on gear pump. | | (3) | | | | |
| **PART C(5 X 15= 75 MARKS)** | | | | | | | |
| 16. | a. | | Calculate the capillary rise in a glass tube of 2.5 mm diameter when immersed vertically in (a)water and (b) mercury. Take surface tension of water as 0.0725 N/m and for mercury 0.52 N/m in contact with air. The specific gravity for mercury is given as 13.6 and angle of contact is 130o. | | | 10 | |
| b. | | Explain vapour pressure. | | | 5 | |
| (OR) | | | | | | | |
| 17. | 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 centre of pressure on the plane surface when its upper edge is horizontal and (a) coincides with water surface (b) 2.5 m below the free water surface. | | | 15 | |
| 18. | a. | | Water flows through a pipe AB 1.2 m diameter at 3 m/s and then passes through a pipe BC 1.5 m diameter. At C, the pipe branches. Branch CD is 0.8 m in diameter and carries one third of the flow in AB. The flow velocity in branch CE is 2.5 m/s. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE. | | | 15 | |
| (OR) | | | | | | | |
| 19. | a. | | What are the assumptions made in Bernoulli’s Equation? | | | | 5 |
| b. | | The water is flowing through a pipe having diameters 20 cm and 10 cm at sections 1 and 2 respectively. The rate of flow through pipe is 35 liters/s. The section 1 is 6 m above datum and section 2 is 4 m above datum. If pressure at section 1 is 39.24 N/cm2, find the intensity of pressure at section 2. | | | | 10 |
| 20. | a. | | A tank has two identical orifices in one of its vertical sides. The upper orifice is 3 m below the water surface and the lower orifice is 5 m below the water surface. If the value of coefficient of velocity for each orifice is 0.96, find the point of intersection of the two jets. | | | | 7 |
| b. | | A rectangular weir of crest length 50 cm is used to measure the rate of flow of water in a rectangular channel of 80 cm wide and 70 cm deep. Determine the discharge in the channel if the water level is 80 mm above the crest of weir. Take velocity of approach into consideration and value coefficient of discharge is 0.62. | | | | 8 |
| (OR) | | | | | | | |
| 21. |  | | Two sharp ended pipes of diameters 50 mm and 100 mm respectively, each of length 100 m are connected in parallel between two reservoirs which have a difference of level of 10m. If the coefficient of friction for each pipe is (4f) 0.32, calculate the rate of flow for each pipe and the diameter of a single pipe 100 m long which would give the same discharge, if it were substituted for the original two pipes. | | | 15 | |
| 22. |  | | A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 rpm works against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40o at outlet. If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm, determine:   1. Vane angle at inlet 2. Work done by impeller on water per second 3. Manometric efficiency | | | 15 | |
| (OR) | | | | | | | |
| 23. |  | | A single acting reciprocating pump has piston diameter 12.5 cm and stroke length 30 cm. The centre of the pump is 4 m above the water level in the sump. The diameter and length of suction pipe are 7.5 cm and 7 m respectively. The separation occurs if the absolute pressure head in the cylinder during suction stroke falls below 2.5 m of water. Calculate the maximum speed at which the pump can run without separation. Take atmospheric pressure head = 10.3 m of water | | |  | |
| 24. |  | | A penstock supplies water from a reservoir to the pelton wheel with a gross head of 500 m. One third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is 2 m3/s. The angle of deflection of the jet is 1650. Determine the power given by the water to the runner and hydraulic efficiency of the pelton wheel. Take speed ratio as 0.45 and coefficient of velocity as 1. | | | 15 | |
| (OR) | | | | | | | |
| 25. |  | | A Francis turbine working under a head of 30 m has a wheel diameter of 1.2 m at the entrance and 0.6 m at the exit. The vane angle at the entrance is 90o and guide blade angle is 15o. The water at the exit leaves the vanes without any tangential velocity and the velocity of flow in the runner is constant. Neglecting the effect of draft tube and losses in the guide and runner passages, determine the speed of the wheel in rpm and vane angle at the exit. State whether the speed calculated is synchronous or not. If not, what speed would you recommend to couple the turbine with an alternator of 50 cycles. | | | 15 | |

ALL THE BEST