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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 :** | **09CE216/12CE209/CE246** | **Duration :** | **3 hrs** |
| **Sub. Name :** | **Applied Hydraulics & Fluid Machines/**  **Applied hydraulics & Hydraulic Machinery** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | **Marks** |
| **PART-A(10X1=10 MARKS)** | | |
| 1. | What is the relationship between Chezy’s Constant and Manning’s n. | (1) |
| 2. | In a flow field, the velocity is given by υ = 4x + 3t2. The type of flow is   1. Steady (b) unsteady (c) steady & uniform (d) unsteady & non-uniform | (1) |
| 3. | List few methods of preventing the separation of boundary layer. | (1) |
| 4. | What is a stream lined body? | (1) |
| 5. | What are the functions of draft tube? | (1) |
| 6. | Write the expression for the specific speed of a turbine. | (1) |
| 7. | What is priming? | (1) |
| 8. | What are the functions of air vessels? | (1) |
| 9. | What is impulse? | (1) |
| 10. | Write two applications of impulse momentum equation. | (1) |

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| **PART B(5 X 3= 15 MARKS)** | | |
| 11 | What is a back water curve? In the zone three of mild channel, what type of profile will you get? | (3) |
| 12 | Write a brief note on wave drag. | (3) |
| 13 | Derive the expression for the force exerted by a jet on a stationary flat plate held normal to the direction of jet. | (3) |
| 14 | How do you select turbines based on specific speed? | (3) |
| 15 | Write a brief note on minimum starting speed. | (3) |

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| **PART C(5 X 15= 75 MARKS)** | | | |
| 16. | a. | Determine the dimensions of the most economical trapezoidal channel section with side slope of 2v to 1H to give a discharge of 6m3/s at a velocity of 1.5 m/s. Chezy’s constant is 50. | (10) |
| b. | Prove that the critical depth yc is given by yc = (q2/g)⅓ when g is discharge per unit width. | (5) |
| (OR) | | | |
| 17. | a. | Water flows at a rate of 1.2 m3/s along a rectangular channel of width 1.6m. Calculate the critical depth. If hydraulic jump is formed in the channel, determine the height of jump and energy lost if the depth before jump is 220mm. | (9) |
| b. | Draw the flow profiles in a critical channel. | (6) |
| 18. | a. | Derive an expression for momentum thickness. | (5) |
| b. | For the velocity distribution given by  u y y 2    ----- = 3 ----- - 2 ------  U δ δ  Determine the momentum thickness. | (10) |
| (OR) | | | |
| 19. | a. | Derive an expression for displacement thickness. | (5) |
| b. | For the velocity distribution given by  u y y 2  ----- = 3 ----- - 2 ------  U δ δ  Determine the momentum thickness. | (10) |
| 20. | a. | Prove that the force exerted by a jet of velocity V on a flat plate moving with a velocity of u is F= ρa (V-u)z where ρ is the density of the fluid. | (3) |
| b. | A rectangular plate of weight 6 kg is suspended vertically by a hinge. The centre of gravity of the plate is 10 cm from the hinge. A horizontal jet of water 3 cm diameter whose axis is 15 cm below the hinge impinges normally on the plate with a velocity of 5m/sec. Find the horizontal force applied at the centre of gravity to maintain the plate in the vertical position. Find also the alternation of velocity of jet if the plate is deflected through 30° and the same force continues to act at the centre of gravity of the plate. | (12) |
| (OR) | | | |
| 21. | a. | Prove that the force exerted in the direction of jet by a jet of velocity V that strikes a plate inclined at an angle Ø with respect to the direction of jet is given by F = ρav2 sin2 Ø. | (3) |
| b. | A 15m/s velocity jet of water 5 cm in diameter strikes normally a flat smooth plate. Determine the force exerted by the jet on the place, if (i) the plate is at rest (ii) it moves in the direction of jet with a velocity of 5 m/s. Also determine the work done in each case and the efficiency of jet in the second case. | (12) |
| 22. | a. | What is mechanical efficiency of a turbine? | (3) |
| b. | With a neat sketch, explain governing of an impulse turbine. | (12) |
| (OR) | | | |
| 23. | a. | What is jet ratio? How is it related to number of buckets in Pelton wheel? | (3) |
| b. | A Kaplan turbine produces 60,000 hp under a head of 25m with an over all efficiency of 90%. Taking the value of speed ratio as 1.6 and flow ratio as 0.5, and the hub diameter as 0.35 times the outer diameter, Find the diameter and speed of the turbine. | (12) |
| 24. | a. | Define manometric head. | (3) |
| b. | The axis of centrifugal pump is 2.5 m above water level and the static lift from the pump centre is 33.5m. The frictional losses in the suction and delivery pipes are 1m and 7.5 m respectively. The diameter of suction and delivery pipe is 7.5 cm each. The impeller is 30 cm diameter and 1.5 cm wide at outlet. The speed of the pump is 1700 rpm. The water at inlet has radial flow and the vane angle at outlet is 32° to the tangent to the periphery. Compute the discharge of pump and the power required. | (12) |
| (OR) | | | |
| 25. | a. | What is negative slip and when does it occur? | (2) |
| b. | Draw the indicator diagram considering acceleration and friction heads. | (2) |
| c. | A single acting reciprocating pump having plunger diameter as 15cm, stroke length 22.5cm has a suction pipe of length 6 m. The suction head is 3m and the diameter of the suction pipe is 7.5cm. For delivery pipe of diameter 7.5cm, length 60m, Hd 27m, find the maximum possible speed at which separation of water could be avoided. | (11) |

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