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**End Semester Examination – Nov/Dec– 2018**

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| **Code :** | **18AT2001** | **Duration :** | **3hrs** |
| **Sub. Name :** | **FLUID MECHANICS AND OPEN CHANNEL HYDRAULICS** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Marks** |
|  | **PART-A(20X1=20 MARKS)** | | |
| 1. | Calculate the specific weight and density of one litre of liquid which weighs 7 N. | CO1 | 1 |
| 2. | What is kinematic viscosity? | CO1 | 1 |
| 3. | Differentiate Newtonian and non Newtonianfluid. | CO1 | 1 |
| 4. | What is cavitation? | CO1 | 1 |
| 5. | Define meta centre. | CO1 | 1 |
| 6. | Define vorticity. | CO1 | 1 |
| 7. | Momentum equation for steady flow. | CO1 | 1 |
| 8. | What is stream line? | CO2 | 1 |
| 9. | What are the assumptions made in Bernoulli’s equations? | CO1 | 1 |
| 10. | What are the different classification of orifices? | CO3 | 1 |
| 11. | Define coefficient of contraction. | CO2 | 1 |
| 12. | Define Froude number. | CO1 | 1 |
| 13. | Differentiate laminar and turbulent flow. | CO1 | 1 |
| 14. | Differentiate rotational and irrotational flow. | CO2 | 1 |
| 15. | What are the advantages of triangular notch? | CO3 | 1 |
| 16. | What is cipoletti weir? | CO3 | 1 |
| 17. | What is pitot tube. | CO2 | 1 |
| 18. | Define total energy line. | CO1 | 1 |
| 19. | What is hydraulic jump? | CO2 | 1 |
| 20. | What is kinematic similarity? | CO2 | 1 |

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|  | **PART B(10 X 5= 50 MARKS)**  **(Answer any 10 from the following)** | | |
| 21. | A simple manometer (U-tube) containing mercury is connected to a pipe in which an oil of Sp.gr. 0,8 is flowing. The pressure in the pipe is vacuum. The other end of the manometer is open to the atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 20 cm and height of oil in the left limb from the centre of the pipe is 15cm below. | CO1 | 5 |
| 22. | Explain about Euler’s equation for motion of a fluid. | CO1 | 5 |
| 23. | Represent schematically the Bernoulli’s equation for flow through a tapering pipe and show the position of total energy line and the datum line. | CO1 | 5 |
| 24. | With neat sketches, explain the conditions of equilibrium for floating and submerged bodies. | CO1 | 5 |
| 25. | Explain how velocity of flow at any point in a pipe or a channel can be measured, with a pitot tube. | CO2 | 5 |
| 26. | Determine the rate of flow of water through a pipe of diameter 10 cm and length 60 cm which one end the pipe is connected to a tank and other end of the pipe is open to atmosphere. The height of water in the tank from the centre of the pipe is 5 cm. Pipe is given as horizontal and value of *f=*0.01.Consider minor losses. | CO2 | 5 |
| 27. | A trapezoidal channel has a base width of 8.3 m and sides rise 1m vertically for every 2 m horizontally.Depth of flow in the channel is 2.7m , its gradient is 0.001 and Manning’s ‘n’ is 0.035 s/m. | CO3 | 5 |
| 28. | The head of water over an orifice of diameter 40 mm is 10m. Find the actual discharge and actual velocity of the jet at vena contracta. Take Cd= 06 and Cv=0.98. | CO3 | 5 |
| 29. | Derive the condition for maximum discharge through a channel of trapezoidal section. | CO3 | 5 |
| 30. | State Buckingham’s π theorem.Why this theorem is considered superior over Rayleigh’s method for dimensional analysis. | CO2 | 5 |
| 31. | Explain the dimensional homogeneity, with an example. | CO2 | 5 |
| 32. | Define the following dimensionless numbers and mention their significance in fluid flow problems:  i) Reynold’s no.; ii) Froude’s no.; iii) Mach no. | CO2 | 5 |

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|  | **PART C(2 X 15= 30 MARKS)**  **(Answer any 2 from the following)** | | | |
| 33. | a. | With neat sketch, explain working of differential U tube manometer and derive relation for measuring pressure difference between two pipes. | CO1 | 8 |
| b. | A wooden block of size 6m x5 mx 3m height floats in freshwater. Find the depth of immersion and determine the metacentric height. Specific gravity of wood is 0.70. Find the volume of concrete block placed on the wooden block, so as to completely submerge the wooden block in water. Take specific gravity of concrete as 3.0 . | CO1 | 7 |
| 34. | a. | Differentiate between orifice meter and venturimeter with neat sketches | CO1 | 8 |
| b. | A horizontal venturimeter with 50 cm diameter at inlet and 20cm throat diameter is used for measuring rate of water flow, if the pressure at inlet is 1.8 Bar and vacuum pressure at the throat is 30 cm of mercury, find the rate of flow. Assume 10 % differential pressure head is lost between the inlet and throat section. Assume coefficient of discharge is 0.96. | CO1 | 7 |
| 35. | a. | Explain model similitude and non dimensional numbers. | CO2 | 8 |
| b. | The pressure difference ∆p for a viscous flow in a pipe depends upon the diameter of the pipe ‘D’ length of pipe ‘L’,velocity of flow’ V’, viscosity of fluid µ and density of fluid ρ. Using Buckingham’s theorem, show that the relation for pressure difference ∆p is given by ∆p= ρ V2f (1/Re, L/D). | CO2 | 7 |