

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE
End Semester Examination – Winter 2018
Course: B. Tech in Civil Engineering
Sem: III
Subject Name: Hydraulics I
Subject Code: BTCVC303
Max Marks: 60
Date: 05-12-2018
Duration: 3 Hr.
Instructions to the Students:

1. Solve all questions out of the following.
2. The level question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

	(Level/CO)	Marks
Q.1 Solve Any Three of the following.		
A) Explain the different applications of Fluid Mechanics in Civil Engineering.	CO2	04
B) Define: Surface Tension and Bulk modulus. Give proper unit of each.	CO2	04
C) Calculate the dynamic viscosity of oil, which is used for lubrication between a square plate of size $0.8 \times 0.8 \text{ m}^2$ and plane with angle of inclination 30° . The weight of square plate is 294.5 N and it slides down the inclined plane with uniform velocity of 0.3m/s. The thickness of an oil film is 1.5mm.	CO2	04
D) When a pressure of 20.7 MN/m^2 is applied to 100 liters of a liquid, it's volume decreases by 1 liter. Find the bulk modulus of the liquid and compressibility of liquid.	CO2	04
Q.2 Solve Any Two of the following.		
A) Explain in detail with neat sketch – i) Differential U-Tube Manometer ii) Bourdon Tube Pressure Gauge	CO2	06
B) Prove that the center of pressure of a vertical plane surface is always below the center of gravity.	CO3	06
C) A wooden block of relative density 0.7 has width 15cm, depth 30cm and length 150cm. it floats horizontally on the surface of water. Calculate the volume of water displaced, depth of immersion and position of center of buoyancy. Also find the metacentric height.	CO3	06
Q.3 Solve the following.		
A) Derive a three dimensional general continuity equation in Cartesian co-ordinates.	CO3	06
B) The velocity of component in a two dimensional flow are	CO3	06
$u = 2xy \quad v = b^2 + x^2 - y^2$		
i) Is the flow possible?		
ii) Determine potential function.		
iii) Determine corresponding stream function.		

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Q.4 Solve Any Two of the following

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| A) Derive an expression for point velocity distribution for laminar flow between two fixed parallel plates. | CO3 | 06 |
| B) Explain with neat sketches the difference between hydro dynamically smooth & rough boundaries. | CO2 | 06 |
| C) Explain Prandtl's Mixing Length Theory and Nikuradse's experiment. | CO2 | 06 |

Q.5 Solve Any Two of the following.

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| A) Write short note on Non-dimensional numbers – i) Froude number ii) Weber Number iii) Reynold's Number. | CO3 | 06 |
| B) Explain concept of equivalent pipe & Derive Dupit's equation in form
$\frac{L}{D^5} = \frac{L_1}{D_1^5} + \frac{L_2}{D_2^5} + \frac{L_3}{D_3^5} + \dots$ | CO3 | 06 |
| C) What is Siphon? Explain its working with neat sketch. | CO2 | 06 |

*** End ***

