

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
THIRD SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

**Course Code: ME203**

**Course Name: MECHANICS OF FLUIDS**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any three full questions, each carries 10marks.*

1  $4 \times 2.5 =$  10 marks

2 Figure 2 marks.

Distance of common Centre of gravity Ans: 2.98m 2 marks.

Depth of immersion h Ans: = 1.803m 2 marks.

Meta-centric height GM Ans: = 0.12m 3 marks.

The pontoon is in stable equilibrium 1 mark.

3  $4 \times 2.5 =$  10 marks

4  $u = 4x^3$   $v = -10x^2y$  and  $w = 2t$   
Velocity is  $V = \sqrt{u^2 + v^2 + w^2} =$  Ans: 51.264 units 4 marks

Acceleration vector  $a = \sqrt{a_x^2 + a_y^2 + a_z^2} =$  Ans: 1568.98 units 6 marks

**PART B**

*Answer any three full questions, each carries 10marks.*

5 (i) Darcy's formula- Ans 2.1m 5 marks

(ii) Chezy's formula - Ans: 2.856m 5 marks

6.  $h = y(S_m - S_1)/S_1 =$  Ans: 2.085m 5marks

$V = \sqrt{2gh}$  Ans: 6.39m/s 5 marks

7. major loss- 2 marks, 4 minor losses - 4x2 =8marks

8. Sketch - 2 marks

Euler's equation 4 marks

Bernoulli's Equation. 2 marks

Assumptions 2 marks

**PART C**

*Answer any four full questions, each carries 10marks.*

9. Momentum thickness definition- 3 marks  
Derivation - 7 marks
10. Displacement thickness 3marks  
Momentum thickness 3marks  
Energy thickness 3marks  
Ratio i) Ans: 5/2 ii) Ans:7/11 ½ marks each
11.  $Re = VL/\nu = 200000$ , laminar 2marks  
(a) Boundary layer thickness at the end of the plate  
 $= 5x/\sqrt{Re}$  Ans: 6.7mm 4marks  
(b) Total drag per unit length on the sides of the plate,  
 $C_D = 1.328/\sqrt{Re}$  Ans:  $2.97 \times 10^{-3}$  2marks  
 $F_D = (1/2 \rho U^2) \times C_D$  Ans: 0.0139N 2marks
12. i) Buckingham's theorem - 2 marks  
ii) Selection of variable 3marks  
b) Reynold's number, Froude's number and Mach's number. - 3x1.5 marks  
Application ½ marks
13.  $f(\pi_1, \pi_2, \pi_3, \pi_4) = 0$ ,  
 $\pi_1 = \Delta P / V^2$ ,  $\pi_2 = \frac{L}{D}$ ,  $\pi_3 = \mu / \rho V D$ ,  $\pi_4 = K/D$  10marks
14. Model law- 2 marks  
Drag Force - Ans: 350kN 4 marks  
Power - Ans: 3.88MW 4 marks

**Note: Evaluation is not strictly based on the final answer. Proportional marks should be given to steps written for each questions.**

**Chairman**

