Total No. of Questions : 8]

SEAT No. :

P4120

[Total No. of Pages :2

[4760] - 1048
M.E. (Civil)
Water Resources and Environmental Engg.
FLUID MECHANICS
(2013 Credit Pattern) (Semester - I) (501083)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithms tables, slide rule, electronics pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Define stream line, streak line, pathline and stream tube. **[4]**

b) Define nominal thickness, displacement thickness and momentum thickness with reference to boundary layer. **[6]**

Q2) a) State assumptions made in Bernoulli's theorem. What are limitations of Bernoulli's theorem. **[4]**

b) The velocity distribution in the turbulent boundary layer over a flat plate is given as $\frac{u}{U_\infty} = 2\frac{y}{\delta} - \frac{1}{2}\left(\frac{y}{\delta}\right)^2$. Obtain an expression for the displacement thickness, momentum thickness and energy thickness. **[6]**

Q3) a) Write a short note on conformal mapping? **[4]**

b) An oil with density 900 kg/m^3 and viscosity 0.16 N-s/m^2 flows through a 20cm diameter pipe. What is the maximum flow that will ensure laminar flow? If the length of the pipe is 200m, find the pressure drop between the two ends of the pipe. **[6]**

Q4) a) Derive equation for stream function and velocity potential for a source. **[5]**

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b) Derive equation for velocity distribution for flow between parallel plates with both plate are at rest starting with Navier-Stokes equations. **[5]**

Q5) a) What is boundary layer separation? What are its effects and how to control it? **[5]**

b) Derive Reynolds equation. **[5]**

Q6) a) Derive Karman momentum equation. **[6]**

b) Write a short note on Reynolds rules of averages. **[4]**

Q7) a) Derive equation for stagnation temperature. **[5]**

b) Discuss the analogy between the normal shock wave and the hydraulic jump. **[5]**

Q8) a) Derive equation for work done in adiabatic process. **[5]**

b) What is the effect of compressibility on drag. **[5]**

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