

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER- I (New course) • REMEDIAL EXAMINATION – SUMMER 2015

Subject Code: 2711103

Date: 14/05/2015

Subject Name: Advanced Fluid mechanics

Time: 10:30 am to 1:00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) What do you understand about exact solution of N-S equation? Explain one exact solution of N-S equation using suitable diagram and mathematical derivation and also list the assumptions made for exact solution. 07

(b) With the help of suitable diagram, explain flow in constant area duct with heating and cooling. 07

Q.2 (a) Explain fluid deformation with the help of suitable diagram and show that vorticity is twice the angular rotation of the fluid element. 07

(b) Using principle of superposition, derive stream function and potential function for source sink pair at fixed distance in uniform stream. Also derived other related parameters for resultant flow obtained from the given flow field. 07

OR

(b) Using principle of superposition, derive stream function and potential function for source in uniform stream. Also derived other related parameters for resultant flow obtained from the given flow field. 07

Q.3 (a) Explain Reynolds analogy for high Reynolds number flow. 07

(b) Explain Prandtl's mixing length hypothesis for turbulent flow. 07

OR

Q.3 (a) Derive Prandtl's boundary layer equation. 07

(b) What do you understand about hydrodynamics stability? Explain in detail. 07

Q.4 (a) Derive Orr Sommerfeld equation. 07

(b) Explain theory of Lubrication for low Reynolds number flow. 07

OR

Q.4 (a) Explain eddy viscosity for turbulent flow in detail Derive equation with the help of suitable mathematical derivation. 07

(b) What is Creeping flow? Explain creeping flow past sphere. 07

Q.5 (a) Derive energy equation in Cartesian coordinates and also derive various forms of energy equation using first principle. 07

(b) How shock form? Why shock forms in supersonic flow? Justify your answer with suitable mathematical derivation. 07

OR

Q.5 (a) Explain effect of back pressure on performance of De-Laval Nozzle. 07

(b) What do you understand about weak and strong shock? Explain shock thickness. 07
