NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF APPLIED CHEMISTRY
SUPPLEMENTARY EXAM JULY 2001
TRANSPORT PHENOMENA SCH 2108
TIME: 2Hours 30minutes

INSTRUCTIONS TO CANDIDATES: Answer **ANY FIVE** questions from this paper.

1. With the aid of a diagram, derive the equation of a pitot tube. State one disadvantage of a pitot tube over the venturi meter. (20 marks)

2. Oil flowing at the rate of 7258kg/hr with $C_p = 2.01$kJ/kg.K is cooled from 394.3 to 338.9K in a countercurrent heat exchanger by water entering at 294.3K. And leaving at 305.4K. Calculate flowrate of the water and the overall heat transfer coefficient K if the area is 5.11m^2. (20 marks)

3. a) Compare the Bernoulli equation to the equation of the total energy. (10 marks)

   b) Define friction factor f. What are the factors affecting it? (10 marks)

4. Give a brief classification of fluids using Newtons Law of Viscosity equation. (20 marks)

5. Derive the equation for heat transfer by conduction through a thick cylindrical tube. (20 marks)

6. A fluid is flowing external to a solid body. The force F exerted on the body is a function of the fluid velocity V, fluid density ρ, fluid viscosity μ, and a dimension of the body L. By dimensional analysis, obtain the dimensionless groups formed from the variables given. Select v, ρ and L as the core variables.
(20 marks)