ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE, NIGERIA
DEPARTMENT OF MECHANICAL ENGINEERING

SECOND SEMESTER EXAMINATIONS
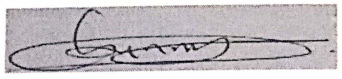
2017/2018 ACADEMIC SESSION

COURSE:	GNE 214 – Fluid Mechanics (3 Units)
CLASS:	200 Level General Engineering
TIME ALLOWED:	3 Hours
INSTRUCTIONS:	Answer any **FOUR** questions

HOD'S SIGNATURE

Date: July/August 2018

Question 1 (Fluids and fluid properties)

a. Write short note on the following terms in relation to Fluid Mechanics:

(i) Newtonian fluids (ii) Ideal fluids (iii) Surface Tension (iv) Capillarity

b. What is the effect of temperature on viscosity of liquids and gases?

c. Is it possible for an insect to walk freely on the surface of the water, then why?

d. Consider the flow of a fluid with viscosity μ through a circular pipe shown in **fig Q1**. The velocity profile in the pipe is given as $u(r) = u_{max}(1 - r^n/R^n)$, where u_{max} is the maximum flow velocity, which occurs at the centerline; r is the radial distance from the centerline; and u(r) is the flow velocity at any position r. Develop a relation for the drag force exerted on the pipe wall by the fluid in the flow direction per unit length of the pipe.
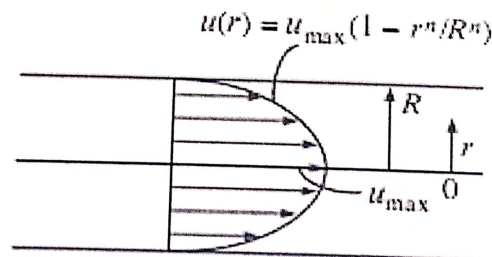

$$u(r) = u_{max}(1 - r^n/R^n)$$

fig Q1

Hint: $\tau_w = \mu \dfrac{\delta u}{\delta y} = -\mu \dfrac{\delta u}{\delta r}$; $A_w = \pi D L$

ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE, NIGERIA
DEPARTMENT OF MECHANICAL ENGINEERING

SECOND SEMESTER EXAMINATIONS
2017/2018 ACADEMIC SESSION

COURSE: GNE 214 – Fluid Mechanics (3 Units)

CLASS: 200 Level General Engineering

TIME ALLOWED: 3 Hours

INSTRUCTIONS: Answer any **FOUR** questions

HOD'S SIGNATURE

Date: July/August 2018

Question 1 (Fluids and fluid properties)

a. Write short note on the following terms in relation to Fluid Mechanics:

(i) Newtonian fluids (ii) Ideal fluids (iii) Surface Tension (iv) Capillarity

b. What is the effect of temperature on viscosity of liquids and gases?

c. Is it possible for an insect to walk freely on the surface of the water, then why?

d. Consider the flow of a fluid with viscosity μ through a circular pipe shown in **fig Q1**. The velocity profile in the pipe is given as $u(r) = u_{max}(1 - r^n/R^n)$, where u_{max} is the maximum flow velocity, which occurs at the centerline; r is the radial distance from the centerline; and u(r) is the flow velocity at any position r. Develop a relation for the drag force exerted on the pipe wall by the fluid in the flow direction per unit length of the pipe.
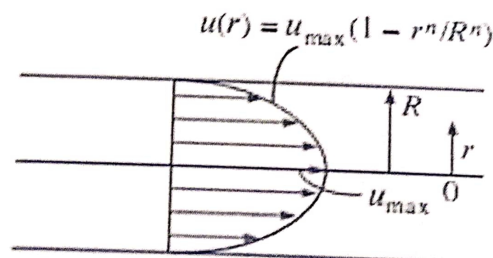
$$u(r) = u_{max}(1 - r^n/R^n)$$

fig Q1

Hint: $\tau_w = \mu \dfrac{\delta u}{\delta y} = -\mu \dfrac{\delta u}{\delta r}$; $A_w = \pi DL$