



**UNIVERSITI KUALA LUMPUR**  
**Malaysian Institute of Marine Engineering Technology**

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**FINAL EXAMINATION**  
**OCTOBER 2025 SEMESTER SESSION**

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**SUBJECT CODE** : LGD22203 / LGD20702

**SUBJECT TITLE** : FLUID MECHANICS

**PROGRAMME NAME** : DIPLOMA OF ENGINEERING TECHNOLOGY  
(FOR MPU: PROGRAMME LEVEL) (NAVAL ARCHITECTURE AND SHIPBUILDING)

**TIME / DURATION** : 09.00 AM - 12.00 PM  
(3 HOURS)

**DATE** : 30 JANUARY 2026

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**INSTRUCTIONS TO CANDIDATES**

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1. Please read **CAREFULLY** the instructions given in the question paper.
  2. This question paper has information printed on both sides of the paper.
  3. This question paper consists of **TWO (2)** sections; Section A and Section B.
  4. Answer **ALL** question in Section A, and **TWO (2)** questions **ONLY** in Section B.
  5. Please write your answers on this answer booklet provided.
  6. Answer **ALL** questions in English language **ONLY**.
  7. Tables, formulae and charts have been appended for your reference.
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**THERE ARE 4 PAGES OF QUESTIONS, EXCLUDING THIS COVER PAGE.**

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## SECTION A (Total: 60 marks)

**INSTRUCTION: Answer ALL questions.**

**Please use the answer booklet provided.**

## Question 1

- (a) **Differentiate** between a liquid and a gas. (6 marks)
- (b) **Explain** why pressure increases with depth. (8 marks)
- (c) **Describe** laminar flow and turbulent flow. (6 marks)

## Question 2

- (a) A tank contains water of density  $1000 \text{ kg/m}^3$ .
- i. **Determine** the pressure at a depth of 5 m below the free surface. (4 marks)
- ii. **Calculate** the absolute pressure at this depth if atmospheric pressure is 101 kPa. (4 marks)
- (b) A rectangular wooden block of dimensions  $0.6 \text{ m} \times 0.4 \text{ m} \times 0.3 \text{ m}$  floats in fresh water (density =  $1000 \text{ kg/m}^3$ ). The density of the wood is  $600 \text{ kg/m}^3$ . **Determine:**
- i. the buoyant force acting on the block (4 marks)
- ii. the volume of water displaced (4 marks)
- iii. the depth of immersion of the block (4 marks)

## Question 3

- (a) Oil with a specific gravity of 0.85, flows through a pipe at a velocity of 2 m/s. The diameter of the pipe is 10 cm. **Calculate** volume flow rate and mass flow rate of the oil.

(6 marks)

- (b) Oil flows through a pipe line which contracts from 450 mm diameter at A to 300 mm diameter at B and then forks, one branch being 150 mm diameter discharging at C and the other branch 225 mm diameter discharging at D as illustrated in Figure 3.1 below. If the velocity at A is 1.8 m/s and the velocity at D is 3.6 m/s, **determine**:

- i. the discharge at C and D;

(8 marks)

- ii. the velocity at B and C ;

(6 marks)

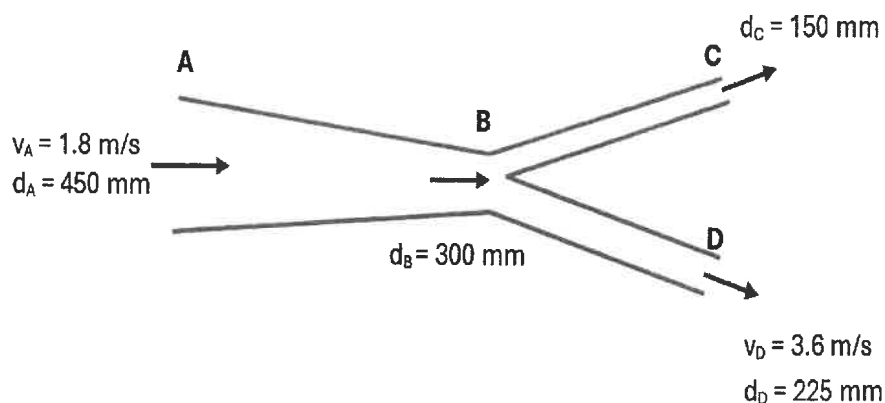


Figure 3.1: Branches Pipe

## SECTION B (Total: 40 marks)

INSTRUCTION: Answer only TWO (2) questions.

Please use the answer booklet provided.

## Question 4

Diesel fuel is pumped at a rate of 300 L/min through a concrete (spun) pipe of diameter 200 mm and length 1.5 km. The relative density of the diesel is 0.85 and the kinematic viscosity of diesel is  $3.5 \times 10^{-6} \text{ m}^2/\text{s}$ . **Determine:**

- (a) the Reynolds Number and the flow regime (6 marks)
- (b) the friction factor (7 marks)
- (c) the head loss (4 marks)
- (d) the pressure drop due to the head loss (3 marks)

## Question 5

A  $60^\circ$  bend in a horizontal plane has its cross-sectional areas at inlet and outlet equal to  $1 \text{ m}^2$  and  $0.5 \text{ m}^2$  respectively as shown in Figure 5.1. **Examine** the magnitude and direction of the resultant force required to hold the bend in position if the velocity of water at inlet is 10 m/s and the pressure at inlet and outlet is  $40 \text{ kN/m}^2$  and  $30 \text{ kN/m}^2$  respectively.

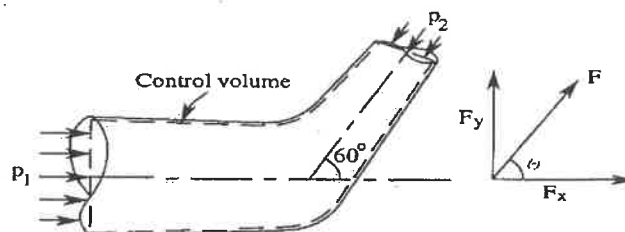


Figure 5.1

(20 marks)

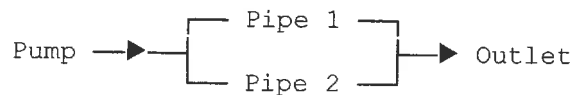
**Question 6**

A pumping system as shown in Figure 6.1, delivers  $0.08 \text{ m}^3/\text{s}$  of water using either:

- **Option A:** Two identical pipes in **series**
- **Option B:** Two identical pipes in **parallel**

Each pipe has:

- Length = 100 m
- Diameter = 0.18 m
- Friction factor = 0.022

**Series Configuration (Option A)****Parallel Configuration (Option B)**

*Figure 6.1: Schematic Diagram (Comparison)*

**Analyse:**

- (a) the total head loss for **Option A**. (8 marks)
- (b) the total head loss for **Option B**. (8 marks)
- (c) which configuration is more energy efficient and **justify your answer**. (4 marks)

**END OF QUESTION**

## Appendix 1: Absolute Roughness of Various Common Pipe Materials

<i>Absolute roughness</i>	mm
Cast iron	0.25
Commercial steel or wrought iron	0.045
Galvanised iron or steel	0.15
Concrete (cast on steel forms)	0.2
Concrete (spun)	0.1
Drawn tube	0.0015
Extruded tube made of metal, glass or plastic	0 (smooth)

*Note* The roughness values quoted are for pipes in the as-manufactured condition. The values are likely to increase with time, owing to the effects of corrosion, erosion and fouling.

## Appendix 2: Table of Formulae

$Re = \frac{\rho v d}{\mu}$	$\rho = \frac{m}{v}$
$Re = \frac{v d}{\nu}$	$Q = Av$
$\epsilon_R = \frac{\epsilon}{d}$	$\dot{m} = \rho Av$
$h_L = \frac{f L v^2}{2 g d}$	$p = \rho g h$
$h_L = K \frac{v^2}{2 g}$	$p = \frac{F}{A}$
$f = \frac{64}{Re}$	$F_B = \rho g V$
$f = 0.0055 \left[ 1 + \left( 20000 \epsilon_R + \frac{10^6}{Re} \right)^{\frac{1}{3}} \right]$	$\frac{p_1}{\rho g} + \frac{v_1^2}{2g} + z_1 = \frac{p_2}{\rho g} + \frac{v_2^2}{2g} + z_2$
$H_L = \left( \frac{f L}{d} + \Sigma K \right) \frac{v^2}{2g}$	$H_{stat} = \frac{p_2 - p_1}{\rho g} + (h_2 - h_1)$
$Le = \frac{\Sigma K d}{f}$	$H_{dyn} = \frac{v_2^2 - v_1^2}{2g} + H_L$
$\frac{f_E L_E}{d_E^5} = \frac{f_A L_A}{d_A^5} + \frac{f_B L_B}{d_B^5} + \dots$	$H_{system} = H_{stat} - H_{dyn}$
$\left( \frac{d_E^5}{f_E L_E} \right)^{1/2} = \left( \frac{d_A^5}{f_A L_A} \right)^{1/2} + \left( \frac{d_B^5}{f_B L_B} \right)^{1/2} + \dots$	$\Delta p = \rho g H_L$
$F = \dot{m}(v_2 - v_1)$	$P_f = \dot{m} g H$
$p_1 A_1 - p_2 A_2 + F = \dot{m}(v_2 - v_1)$	$\eta = \frac{P_f}{P}$