

**Assignment 02 – Steam Systems, Fuel Gas Supply, Vertical Transportation, Telecommunication and Extra Low Voltage Systems (2025-2026)****1. Steam Systems**

1.1 Explain the unique properties of steam which can provide many benefits for building and industrial applications. Calculate how much flash steam will be produced and the residual condensate when 1800 kg.h<sup>-1</sup> of condensate at 7 bar gauge passes through a steam trap to 1 bar gauge.

Given: Specific enthalpy of water at 7 bar gauge = 721 kJ.kg<sup>-1</sup>

Specific enthalpy of water at 1 bar gauge = 505 kJ.kg<sup>-1</sup>

Specific enthalpy of evaporation at 1 bar gauge = 2201 kJ.kg<sup>-1</sup>

(10 marks)

1.2 Explain the meaning of superheated steam. Discuss the disadvantages of using superheated steam as the heating medium in process heat exchangers and other heating processes. Explain the function of a steam separator.

(7 marks)

**2. Fuel Gas Supply**

2.1 Briefly describe the different methods for arranging a liquefied petroleum gas (LPG) supply system in buildings. A commercial laundry equipment running on LPG (with a calorific value of 116 MJ/m<sup>3</sup>) has a heat output of 50 kW and an efficiency of 70%. Determine the flow rate of LPG required for the appliance. Given the following data and information, calculate the pressure loss of the gas pipe.

<ul style="list-style-type: none"><li>- Gas flow rate = 10 m<sup>3</sup>/hr</li><li>- Pipe diameter = 15 mm</li><li>- Specific gravity of LPG = 1.91</li><li>- Length of the pipe = 4 m</li></ul>	<p>The Pole formula:</p> $Q = 0.0071 \sqrt{\frac{h \times d^5}{s \times l}} \quad (m^3/hr)$
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(10 marks)

2.2 Draw a sketch diagram to show the major design features of a gas service pipe riser installed in a sectional pipe shaft. Discuss the important precautions for designing gas pipes in buildings. What is the most common material used for the gas pipe?

(7 marks)

**3. Vertical Transportation**

3.1 Explain the design requirements for fireman's lift. Describe how the fireman's service mode of a fireman's lift can be activated. Discuss the precautions needed for escalator planning and design to prevent the spread of fire and smoke. Illustrate with diagram(s).

(10 marks)

3.2 A lift system of an office building has six lift cars of rated speed  $2.5 \text{ m.s}^{-1}$  and rated car capacity of 12 persons have door opening times of 3.0 seconds and door closing times of 4.0 seconds. The flight time between adjacent floors of interfloor distance 3.6 m is 4.5 seconds. Assuming passengers can enter/exit at 1.2 seconds (average time), calculate the round trip time (RTT). Assume that the highest floor reached is 11 and the number of stops is 10. If the lift speed is increased to  $3 \text{ m.s}^{-1}$ , what is the effect on the RTT? (9 marks)

3.3 Draw two simplified diagrams to show the typical elements and solutions for the modernisation of existing lifts and escalators respectively. Discuss briefly how the lift smart technologies can contribute in assisting the elderly people in the ageing society like Hong Kong. (10 marks)

3.4 Explain the requirements on energy efficiency of lift and escalator installations in the building energy codes in Hong Kong. Discuss the general approach to enhance energy efficiency for lifts and escalators. (4 marks)

#### **4. Telecommunication Services**

4.1 Explain the meaning of structured cabling system (SCS) and describe the major sub-systems of SCS. What is the main purpose of a firewall system in a telecommunication network? (10 marks)

4.2 Discuss the effective strategies for cable routing and distribution in a high-tech commercial building. Compare the system design options for in-building wireless systems. (7 marks)

#### **5. Extra Low Voltage Systems**

5.1 Briefly describe the three types of extra low voltage (ELV) sources and illustrate with diagrams. Explain the principles of using ELV design to ensure safety of the electric circuit. (8 marks)

5.2 Briefly describe the functions and components of a closed circuit television (CCTV) system. Discuss four examples of the recent technological advances of CCTV systems. (8 marks)