KSCP Examination
2020/2021 Academic Session

September 2021

EAS451 – Timber and Masonry Engineering

Duration : 1 hour

Please ensure that this examination paper contains **FIVE (5)** printed pages before you begin the examination.

Instructions: This paper contains **TWO (2)** questions. Answer **ALL** questions.
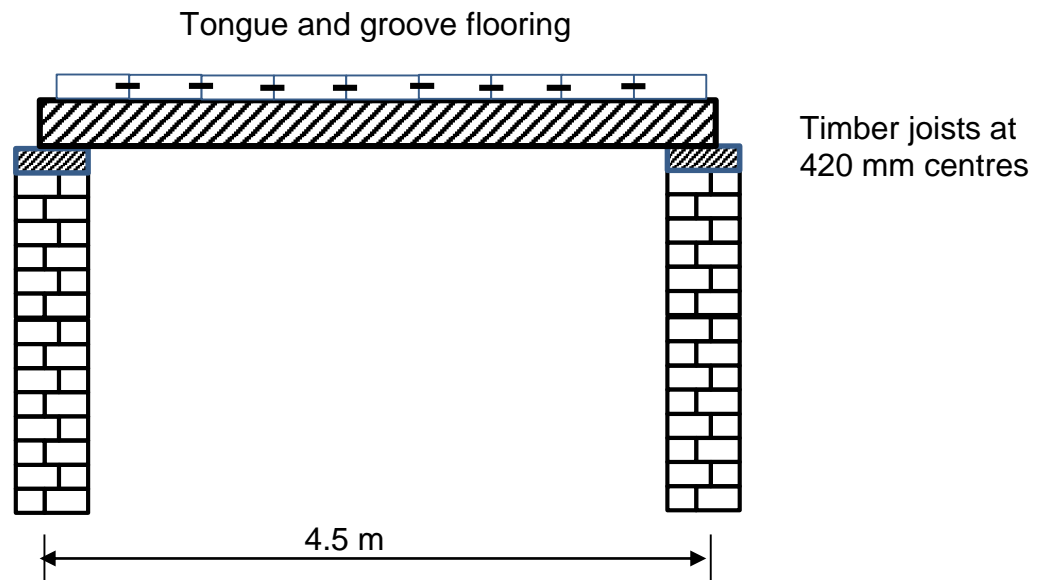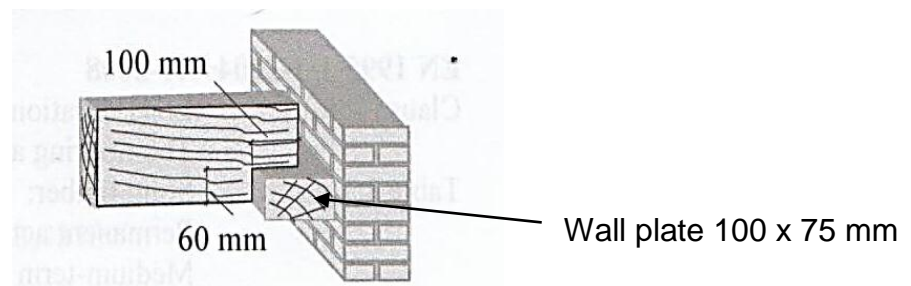
All questions **MUST BE** answered on a new page.

1.   (a).   **Figure 1** and **Figure 2** show series of joists that are placed on timber wall plates of masonry structures to support a suspended timber floor system in a linked double storey house. By using the data given in **Table 1**,

        (i).   Determine a proper section size for the tongue and groove floor boards

        (ii).   Determine the allowable section size for the main joist

        (iii).   By assuming one end of the joist to be notched and supported by a wall plate as shown in **Figure 2**, verify the shear capacity of the joist.

[30 marks]

Table 1

Centres of timber joist	420 mm
Bearing length	100 mm
Span of joist	4.50 m
Thickness of floor boarding	16 mm
Timber Grade	SG4, Standard
Condition	Dry Timber
Imposed load on floor	2.4 kN/m^2
Dead load	0.24 kN/m^2

Tongue and groove flooring

Timber joists at
420 mm centres

4.5 m

Figure 1

100 mm

60 mm

Wall plate 100 x 75 mm

Figure 2

(b).   Malaysian timber for engineering purposes is classified into seven strength groups, SG1 through SG7. Discuss the reasons for this group's classification as well as the impact of this group's classification on timber design criteria.

[20 marks]

2.   (a).   Based on **Figure 3**, determine the characteristic compressive strength masonry (f_k).

Given data

- Ultimate axial load = 140 kN/m including self-weight of the wall
- Wall thickness = 102.5 mm
- Wall length = 4 m
- Eccentricity of loading, $e_x < 0.05\ t$
- Modification factor for effective height (h_{ef}) = 0.75
- Modification factor for effective thickness (t_{ef}) = 1
- Masonry unit category II
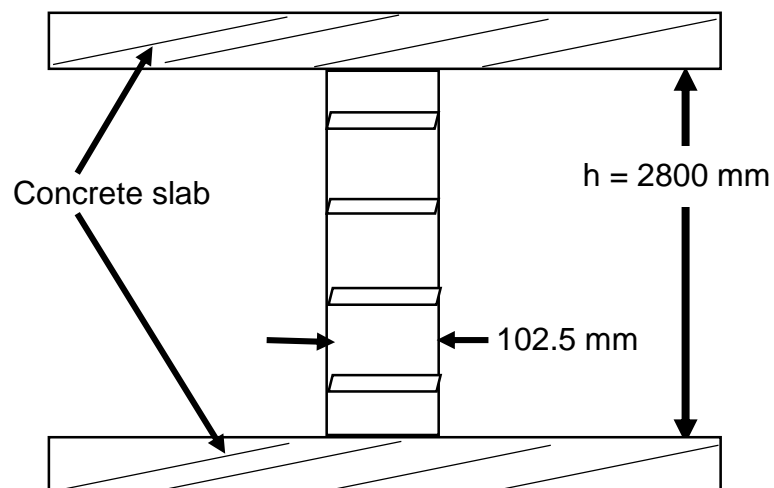- Construction control category is normal

[22 marks]

Figure 3

(b).   Specify **ONE (1)** factor that affects the vertical load resistance in designing a wall and give justification.

[3 marks]

(c).   Damages such as crack and efflorescence can happen due to the rising moisture in a masonry wall. Use a suitable sketch to explain the phenomenon.

[15 marks]

(d).   **Table 2** shows the parameters of hollow concrete block. Determine the maximum height of a building wall and its vertical load resistance. Assume the height (h) is equal to effective height (h_{ef}) and thickness (t) is equal to effective thickness (t_{ef}).

Table 2

Parameters of hollow concrete block	
Size (length x width x height)	390 mm x 190 mm x 190 mm
Mortar designation	iii
Eccentricity	0.05t
Characteristic compressive strength masonry (f_k)	4.5
Compressive strength of unit (N/mm^2)	45
Safety factor for materials (γ_m)	Category normal

[10 marks]

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