Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME	:	RAILWAY INFRASTUCTURE AND FACILITIES
COURSE CODE	:	BNT 20903
PROGRAMME CODE	:	BNT
EXAMINATION DATE	:	JULY/AUGUST 2023
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS 2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK** 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) List down **SIX (6)** components of bridge.

(6 marks)

(b) With aid of diagram, illustrate **THREE (3)** types of bridge in term of compression-tension diagram.

(6 marks)

(c) **Figure 1(c)** shows the single span bridge with length and width of 25 meter and 12 meter respectively.

i. Assume the selfweight of bridge is 25kN/m^2, determine maximum shear force and bending moment acting on the bridge.

(5 marks)

ii. By combining selfweight and RU loading (refer to **Figure 1(c)(i)**), analyze maximum shear force and bending moment acting on the bridge.

(8 marks)

Q2 (a) Briefly explain **THREE (3)** functions of tunnel lining.

(3 marks)

(b) Differentiate the design concept between bridge and tunnel.

(6 marks)

(c) There are several tunneling method commonly used for railway construction such as bored tunnel and sequential excavation. With aid of diagram, briefly explain each of tunneling method.

(6 marks)

(d) Functional classification of stations is divided into **FIVE (5)** types such as halt, flag, roadside or crossing, junction and terminal. Illustrate each type of station.

(10 marks)

Q3 (a) The retaining wall should be designed to sustain the load applied to avoid such failure occurring. Briefly explain **THREE (3)** types of failure of retaining wall.

(6 marks)

(b) There are several types of retaining walls used in railway construction nowadays. Describe **FOUR (4)** types of retaining wall commonly used in Malaysia.

(8 marks)

(c) As a consultant, you are required to check the stability of the proposed retaining wall shown in **Figure Q3(c)**. Related parameter in designing the retaining wall as shown in **Table Q3(c)**.

i. Calculate the Active Soil Pressure, P including related diagram.

(4 marks)

ii. Analyse the vertical load and moment for each element of retaining wall.

(7 marks)

Q4 (a) Briefly explain **FOUR (4)** sources of percolated water in the track.

(8 Marks)

(b) Briefly explain **TWO (2)** track drainage system for the track to cater the surface water.

(4 Marks)

(c) The rectangular surface drain is needed to convey a 10-year ARI according to proposed 5-hectare LRT station at Puchong Damansara, Selangor.

i. Referring to fitting constants (**Table 4(c)(i)**), calculate the design flow for the drain. Assume d = 15 minutes.

(6 marks)

ii. Determine the size of surface drain section. Assume n = 0.013, S_o = 0.5%, drain width, B = 0.9m.

(7 marks)

-END OF QUESTION

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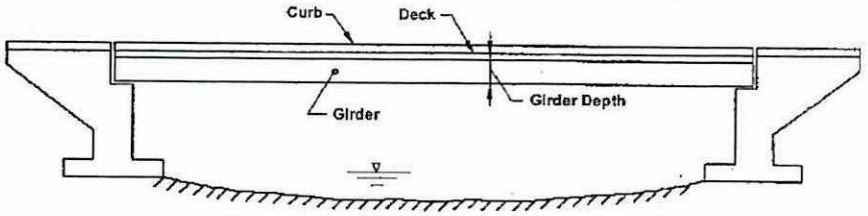

Figure 1(c): Bridge span

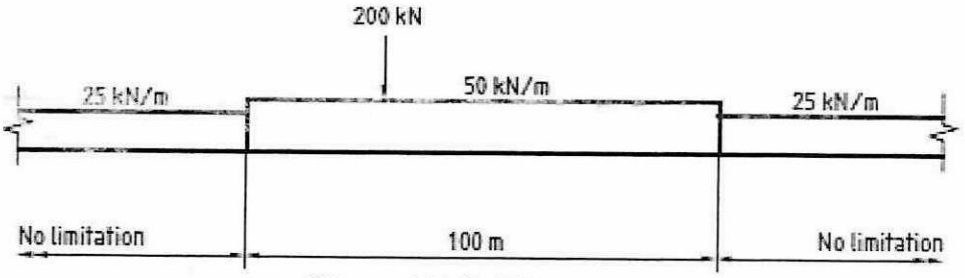

Figure 1(c)(i): RL loading

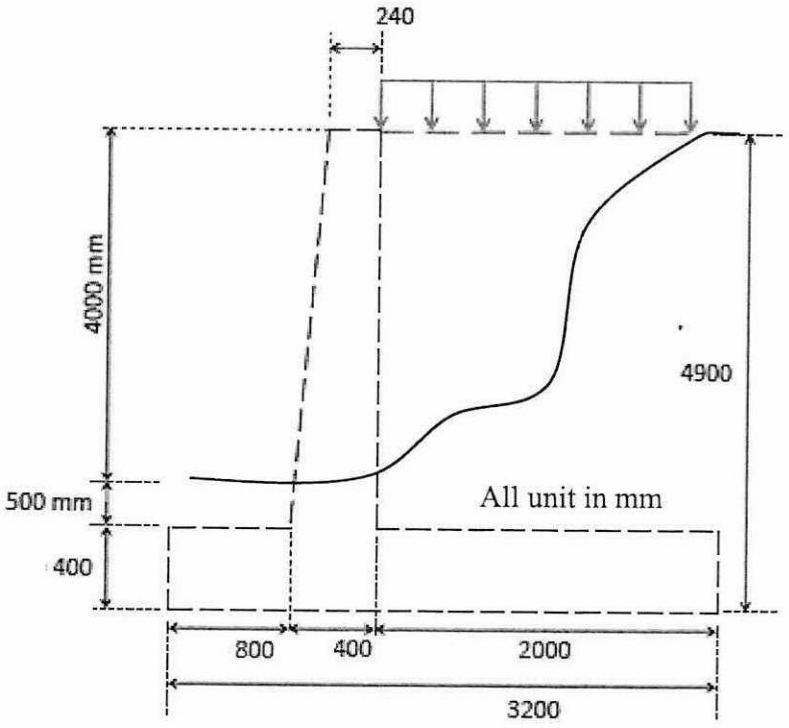

Figure Q3(c)

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Table Q3(c)

Well drained sand, γ_{soil} =	19.0 kN/m^3
Concrete density, $\gamma_{conc.}$ =	24.0 kN/m^3
Angle of internal friction, Ø =	35°
Cohesion, c =	0
Surcharge, w =	10.0 kN/m^2
Soil Bearing Capacity =	200 kN/m^2

Table Q4(c)(i)

λ	K	Θ	η
69.650	0.151	0.223	0.[illegible]

Equations All unit in mm

$$i = \frac{\lambda T^K}{(\Theta)^\eta}, \quad Q = \frac{C.I.A}{360}, \quad R = \frac{A}{P}, Q = vA, v = \frac{1}{\eta} S_0^{\frac{1}{2}} R^{\frac{2}{3}}$$