Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2021/2022

COURSE NAME	:	RAILWAY INFRASTUCTURE AND FACILITIES
COURSE CODE	:	BNT 20903
PROGRAMME CODE	:	BNT
EXAMINATION DATE	:	JULY 2022
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 TE EXAMINATION CONDUCTED VIA CLOSED BOOK

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

Q1 (a) The retaining wall should be designed to sustain the load applied to avoid such failure occur. Briefly explain **THREE (3)** types of failure of retaining wall including related sketch.

(6 marks)

(b) There are several types of retaining wall used in railway construction nowadays. List and briefly explain **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 the **Figure Q1(c)**. Related parameter in designing the retaining wall as shown in **Table Q1(c)**.

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

(4 marks)

ii. Develop the Stability Analysis table.

(7 marks)

Q2 (a) List and briefly explain **FOUR (4)** needs of proper track drainage in railway construction.

(8 Marks)

(b) Differentiate the drainage system of track in railway engineering including example.

(4 Marks)

(c) The rectangular surface drain is needed to convey a 5-year ARI according to proposed 4.5-hectare LRT station at Puchong, Selangor.

i. Calculate the design flow for the drain. Assume d = 12 minutes. Refer to **Table Q2 (c)(i)** for fitting constants.

(6 marks)

ii. Determine the size of surface drain section. Assume n = 0.013, S_o = 0.5%, drain width, B = 0.6m.

(7 marks)

Q3 (a) List and describe all the items below:

i. **THREE (3)** main bridge components.

(6 marks)

ii. **THREE (3)** types of bridge including compression-tension diagram.

(6 marks)

(b) Various types of loads are considered for design of bridge structures. These loads and their combinations decide the safety of the bridge construction during its use under all circumstances. Interpret highway bridge live loads based on BS 5400 Part 2

(5 marks)

(c) Bridge with 30 m deck span showed in **Figure Q3 (c)(i).** Given RL Loading as shown in **Figure Q3 (c)(ii)** acting at mid span.

i. Analyse the maximum shear force using shear force diagram.

(4 marks)

ii. Analyse the maximum bending moment using bending moment diagram.

(4 marks)

Q4 (a) Tunnels are widely used in construction of railway infrastructure. Briefly discuss the advantages and disadvantages of tunnel.

(5 marks)

(b) There are several tunneling method commonly used for railway construction such as bored tunnel and sequential excavation. Briefly explain and illustrate each of tunneling method.

(6 marks)

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

(10 marks)

(d) List and briefly explain **TWO (2)** facilities required at railway stations.

(4 marks)

-END OF QUESTION-

FINAL EXAMINATION

SEMESTER / SESSION : SEMESTER II / 2021/2022
COURSE NAME : RAILWAY INFRASTRUCTURE AND FACILITIES
PROGRAMME CODE : BNT
COURSE CODE : BNT 20903

Table Q1(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 =	30°
Cohesion, c =	0
Surcharge, w =	12.5 kN/m^2
Soil Bearing Capacity =	125 kN/m^2

Table Q2(c)(i)

λ	K	Θ	η
69.650	0.151	0.223	0.880

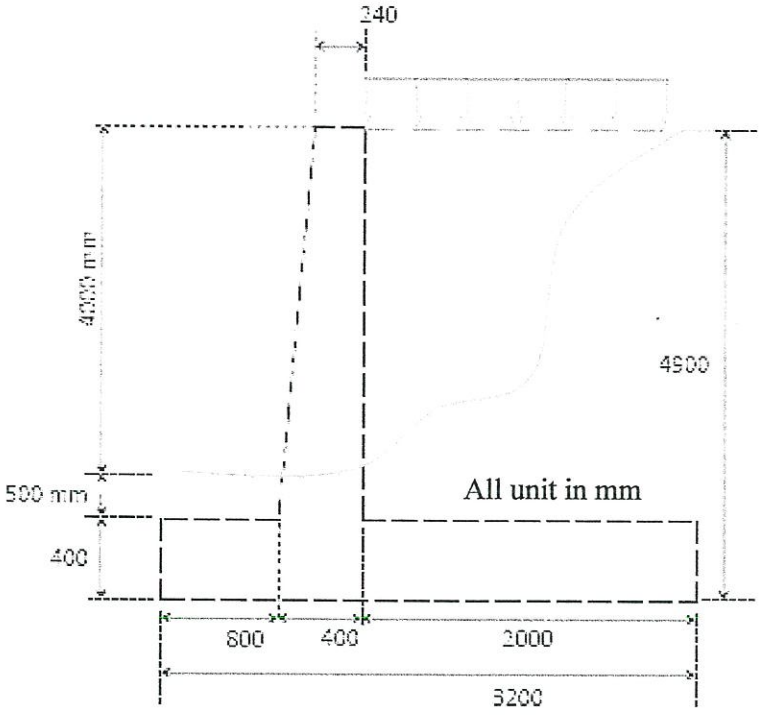

Figure Q1(c)

FINAL EXAMINATION

SEMESTER / SESSION : SEMESTER II / 2021/2022
COURSE NAME : RAILWAY INFRASTRUCTURE AND FACILITIES
PROGRAMME CODE : BNT
COURSE CODE : BNT 20903

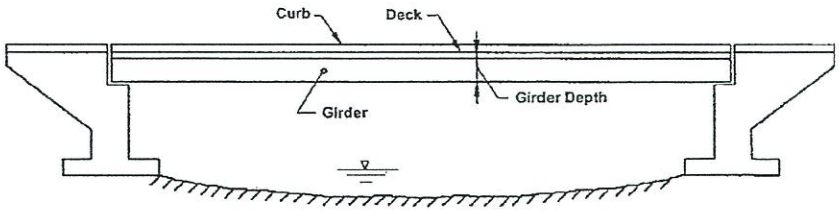

Figure 3(c)(i)

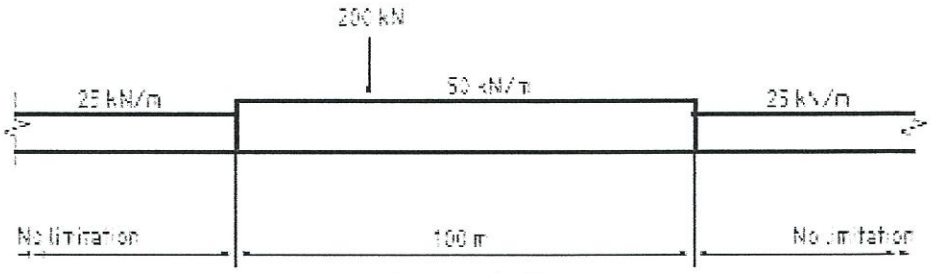

Figure 3(c)(ii)

Equations

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