



UNIVERSITI KUALA LUMPUR
MALAYSIA ITALY DESIGN INSTITUTE

FINAL EXAMINATION
MARCH 2026 SEMESTER

COURSE CODE : PWD20403
COURSE TITLE : RAILWAY SIGNALING AND COMMUNICATION TECHNOLOGY
PROGRAMME NAME : DIPLOMA OF ENGINEERING TECHNOLOGY (RAILWAY SYSTEM)
DATE : 26 JUNE 2026
TIME : 9:00AM - 11:30AM
DURATION : 2 HOURS 30 MINUTES

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of TWO sections.
4. Section A consist total of 60 marks. Answer ALL questions.
5. Section B consist of three questions. Answer TWO (2) questions only.
6. Please write your answer on the answer booklet provided.
7. Please answer all questions in English only.
8. Refer to the attached Formula/ Appendies. ☐ *Tick if applicable*

THERE ARE 7 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 60 marks)

Answer ALL questions.

Please use the answer booklet provided.

Question 1

Basic railway signalling is the system used to safely space trains, control their speeds, and prevent collisions by guiding them along designated paths .

- (a) Define the meaning of 'Headway' and 'Dwell Time' in train regulation system.
(5 marks)
- (b) In your opinion, why is reducing train headway important in modern urban railway systems?
(5 marks)
- (c) Shorter headway is applied during peak hours. Discuss the effect of headway on the throughput of the train regulation.
(5 marks)
- (d) Headway simulation is a tool to enable the designer to design and verify the headway requirements. Point out two(2) examples of input and output data of this simulator
(5 marks)

Question 2

Railway communication encompasses the vital voice, data, and signaling networks used to manage train operations, ensure passenger safety, and drive automated control systems .

- (a) Define the meaning of Professional Mobile Radio(PMR) in TETRA. Give three(3) main features of PMR.

(5 marks)

- (b) If Station A has an emergency such as fire; discuss the specific example of the Public Information Display System (PIDS) and Public Address System (PAS) responsibilities if there are in this situation.

(6 marks)

- (c) State the function of ambient noise sensor and state two(2) possible places to locate this sensor,

(6 marks)

- (d) Explain the effect of bandwidth to the data transfer in the evolvement of radio system.

(3 marks)

Question 3

A train detection system is a critical railway signaling technology used to determine the presence, location, or speed of a train on a specific section of track .

- (a) Name three main components in axle counter.

(3 marks)

- (b) The basic counting of the occupancy of each block or track section depends on the number of axles entering and leaving the respective block.

State the condition to show that the respective block is un-occupied.

Sketch a schematic diagram on how to arrange the axle counter (rail contact) for a single junction that has one(1) point.

(7 marks)

- (c) Name other type of equipment that is also used for train detection and briefly explain how the process of detection occurs on the track by using this equipment.

(10 marks)

SECTION B (Total: 40 marks)

Answer TWO (2) questions only.

Please use the answer booklet provided.

Question 1

A metro signaling system is the complex digital and physical infrastructure used to safely manage train movements, maintain proper spacing, and prevent collisions .

- (a) Automatic Train Operation(ATO) is a part of the Communication Based Train Control (CBTC) architecture. Explain the role of ATO in maintaining safe train regulations.

(7 marks)

- (b) State the use of Norming Point Reader (NPR) which is located at train's underneath and Passive Tag.

(3 marks)

- (c) Define the meaning of 'moving block' in CBTC system.

(5 marks)

- (d) State the different between GOA 4 and GOA 3 in Communication Based Train Control System(CBTC).

(5 marks)

Question 2

A railway signaling layout is the strategic arrangement of tracks, switches (points), and signals to safely govern train movements and manage interlocking logic

- (a) Design the double track Signaling Layout that has two (2) loops, one (1) junction with axle counter, point machines, home signals, intermediate signals and exit signals.

(15 marks)

- (b) State the meaning of 'braking distance' and 'overlap distance' in railway signaling.

(5 marks)

Question 3

Headway is the distance or duration between vehicles in a transportation system. The *minimum headway* is the shortest such distance or time achievable by a system without a reduction in the speed of vehicles.

- (a) Calculate the signal spacing required for 3 aspect signaling system based on the following input data:

Train lengths = 200m

Train braking rate = 0.8 m/s^2

Permitted speed = 80 km/hr

Required Headway = 135 seconds stopping

Gradient is level

The stations are 2 km apart

Overlap distance = 200m

The driver can see all the signals clearly from the distance of at least 400m.

Formula;

$$H_{D3} = (2B + S + O + L)$$

$$H_{T3} = (2B + S + O + L) / V$$

(10 marks)

- (c) State the function of Point Machine and Signal Aspect.

(5 marks)

- (b) State the meaning of 'Redundancy' in railway system.

(5 marks)

END OF EXAMINATION PAPER