



UNIVERSITI KUALA LUMPUR
MALAYSIA ITALY DESIGN INSTITUTE

FINAL EXAMINATION
MARCH 2026 SEMESTER

COURSE CODE : PWB40203
COURSE TITLE : RAILWAY ENGINEERING ASSURANCE
PROGRAMME NAME : BACHELOR OF ENGINEERING TECHNOLOGY (RAILWAY SYSTEM)
WITH HONOURS
DATE : 30 JUNE 2026
TIME : 9:00AM - 11:00AM
DURATION : 2 HOURS

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 ONE sections.
4. Section A consist of five questions. Answer **FOUR (4)** questions only.
5. Please write your answer on the answer booklet provided.
6. Please answer all questions in English only.
7. Refer to the attached Formula/ Appendices. ☐ *Tick if applicable*

THERE ARE 6 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 100 marks)

Answer FOUR (4) questions.

Please use the answer booklet provided.

Question 1

A railway operator intends to introduce a new Automatic Fare Collection (AFC) system to replace its existing ticketing system. The new system must support contactless payment, QR ticketing, mobile applications, and integration with existing railway operations. Before implementation, engineers must ensure that the system requirements are clearly defined and translated into an effective system design.

(a)

Analyse the importance of the System Requirements Analysis and System Design stages in the Systems Engineering Life Cycle (SELC). Discuss how these stages contribute to the successful implementation of the new AFC system and the achievement of operational requirements. (15 marks)

(b)

Evaluate the potential consequences of poorly defined requirements and inadequate system design during the development of the new AFC system. Discuss the effects on project delivery, operational performance, and passenger satisfaction. (10 marks)

(25 marks)

Question 2

A commuter railway operator has experienced a series of operational issues over the past year, including train breakdowns during peak hours, signalling equipment failures, prolonged maintenance activities, and several safety-related incidents involving passengers at stations. These issues have resulted in service delays, increased operating costs, customer complaints, and growing public concern regarding the quality of railway services.

As part of an engineering assurance review, the operator has decided to evaluate the railway system using the RAMS framework.

(a)

From a railway engineering assurance perspective, discuss the roles of RAMS framework in achieving efficient and sustainable railway operations. Support your discussion with relevant railway examples. (15 marks)

(b)

A railway operator has limited financial and maintenance resources and must prioritise improvements in either Reliability or Availability to enhance overall railway performance.

In your opinion, which element should be prioritised by the railway operator? Discuss the relationship between Reliability and Availability, and the potential impacts of your chosen priority on railway operations, maintenance activities, service quality, and passenger satisfaction. (10 marks)

(25 marks)

Question 3

The proposed MRT3 Circle Line project has been identified as a major component of the Greater Klang Valley public transportation master plan. The project is expected to improve connectivity between existing MRT, LRT, Monorail, KTM, and BRT networks while reducing traffic congestion within Kuala Lumpur and surrounding urban areas.

The MRT3 Circle Line involves the integration of multiple railway subsystems supplied by different contractors and manufacturers, including signalling systems, rolling stock, telecommunications, traction power supply, automatic fare collection (AFC), and platform screen doors (PSD). During the implementation stage, several interface and coordination issues were identified, causing delays in testing and commissioning activities.

MRT3 Circle Line within the Klang Valley Integrated Transit Network

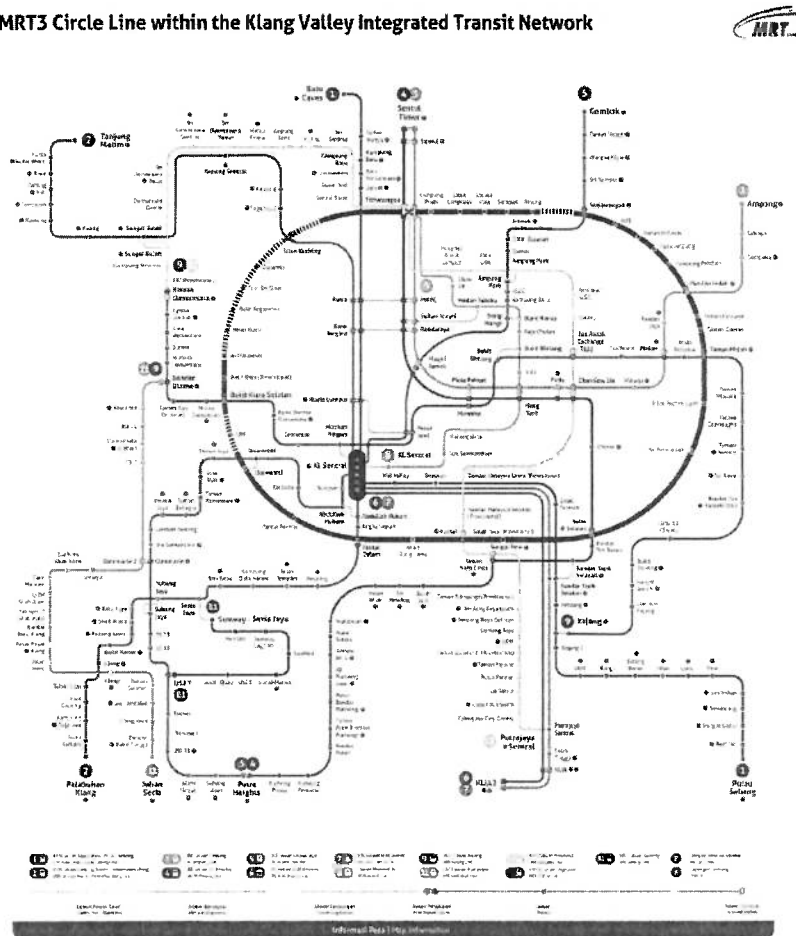


Figure 1: MRT Alignment Plan

(a)

Analyse the importance of system integration in the proposed MRT3 Circle Line project. Discuss THREE major challenges that may arise during the integration of railway subsystems and explain their impacts on project performance, safety, and operational reliability. Provide relevant railway examples in your discussion. (15 marks)

(b)

As a railway engineering assurance engineer, propose suitable engineering assurance strategies to improve coordination and system compatibility during the implementation of the MRT3 Circle Line project. Explain how these strategies can reduce integration issues and improve overall project effectiveness. (10 marks)

(25 marks)

Question 4

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Final-stage testing issues in Shah Alam LRT3 way of opening

Software glitches, system integration faults found during Fault-Free Run; operator undertaking rectification and additional testing

BY MUR ALKAM ZAPIRAH
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SHAH ALAM (Dec 10): The much-anticipated Shah Alam Line (LRT3) has hit a final hurdle, with several technical issues discovered during the last round of testing and commissioning, delaying its opening to the public.

Sources familiar with the project said software-related problems were detected during the Fault-Free Run (FFR), a mandatory regulatory requirement to prove the reliability of the driverless railway system under real operating conditions.

Among the issues identified are inaccurate train docking, door operation irregularities, station departure failures and false alarms triggered by the signalling system, they said.

The FFR involves continuous train operations over thousands of kilometres without any reportable faults or system disruptions. The line must meet strict performance targets, including headway, journey time and system availability, before approval is granted by the relevant authority.

The Land Public Transport Agency (APAD) confirmed that the project proponent has informed the agency of the issues and is taking corrective actions.

"Safety is our top priority. We will only approve operations once the system demonstrates full compliance with all technical and safety requirements," an APAD spokesperson said.

Project representatives said engineers are working around the clock to resolve the glitches. Additional testing cycles will be conducted to ensure the system performs consistently before the line can be declared ready.

The Shah Alam Line, which stretches 17.5km with 13 stations from Bandar Utama to Johan Setia, is expected to improve connectivity and ease congestion along the Federal Highway corridor once operational.

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Safety is our top priority. We will only approve operations once the system demonstrates full compliance with all technical and safety requirements.
- APAD spokesperson

Transport analysts said delays at this stage are not uncommon for complex rail projects.

"It is better to delay than to compromise on safety. Thorough testing is essential, especially for automated systems," said an industry observer.

A new opening date will be announced once all testing requirements are successfully completed and the line receives the green light.

The driverless train must complete thousands of kilometres of Fault-Free Run to prove system reliability and safety before passenger service can begin. (file pic)



TIMELINE OF EVENTS

Initial Target	Testing Phase	Technical Issues Found	Corrective Action	Final Approval
Passenger service originally targeted for Q4 2024.	Fault-Free Run (FFR) commenced as required by regulations.	Software glitches and system integration faults detected during FFR.	Rectification works underway with additional testing cycles.	Subject to successful completion of all testing and regulatory approval by APAD.

Figure 1: Newspaper article on LRT3 delay. Image generated by Artificial Intelligence.

Read the following case study and answer the questions that follow.

The Shah Alam Line (formerly known as LRT3) experienced several delays before commencing passenger service. According to reports (Figure 1), the project encountered challenges during the final stages of testing and commissioning, including software instability, system integration issues, and difficulties in meeting operational performance requirements. The driverless train system was also required to meet specific operational targets, including train frequency and journey time, before receiving approval to operate.

(a)

Discuss the FIVE (5) stages of Testing and Commissioning which contribute to system safety, reliability, and operational readiness. (15 marks)

(b)

Based on the case study, evaluate the consequences of unresolved technical issues during the Testing and Commissioning stage on project delivery, operational performance, passenger confidence, and railway safety. (10 marks)

(25 marks)

Question 5

The railway engineering assurance ecosystem consists of various organisations working collaboratively to ensure railway safety, reliability, compliance, and operational sustainability.

(a)

Analyse the role and responsibility of EACH organisation within the railway engineering assurance ecosystem. (15 marks)

(b)

Using a suitable diagram, illustrate and explain the relationship and interaction between the organizations in the railway engineering assurance ecosystem.

(25 marks)

END OF EXAMINATION PAPER