

**INSTITUTION OF RAILWAY SIGNAL ENGINEERS  
2018 EXAMINATION**

**MODULE 6 – COMMUNICATION APPLICATIONS**

**TIME ALLOWED – 1 1/2 HOURS**

ANSWER **THREE** QUESTIONS, ALL QUESTIONS CARRY EQUAL MARKS

WRITE ON ONE SIDE OF THE PAPER ONLY, AND NUMBER EACH SHEET THAT  
YOU USE CONSECUTIVELY

COMMENCE YOUR ANSWER TO EACH QUESTION ON A NEW SHEET OF PAPER

ANSWER SHEETS WILL BE PHOTOCOPIED – PLEASE USE ONLY BLACK INK

**Question 1**

- a) What is EMC and why is it an important factor to consider within a railway telecommunications environment? [8 marks]
- b) You are responsible for a project that is introducing a new product to work alongside existing telecommunications assets. Describe the measures you would take to ensure that EMC is fully considered. [17 marks]

**Question 2**

You are a designer responsible for the renewal of a network-wide Customer Information System.

- a) Identify and explain the various users of the system and their requirements. [6 marks]
- b) Draw a system diagram of your proposed solution, including all users. [8 marks]
- c) Explain any features you would incorporate to improve accessibility. [3 marks]
- d) Review and evaluate options to improve the accuracy and reliability of your designed system. [8 marks]

**Question 3**

You are required to implement a new telephone concentrator system for a large Signalling Centre.

- a) Describe the factors you would consider when developing the system. [15 marks]
- b) Describe the testing required prior to entry into service and the reasons why. [10 marks]

Paper continued on next page.

#### Question 4

You are responsible for the delivery of a project that is commissioning new and altered telecommunications assets within a rail environment.

- a) Using the project lifecycle, identify what you would do to facilitate effective handover to operations and maintenance personnel [20 marks]
- b) What support could be offered post-handover to the operator or maintainer? [5 marks]

#### Question 5

Provide an outline testing strategy for the migration and commissioning of a new telecoms network to support operational services (e.g. signalling, telephony and remote diagnostics). Your answer should include a basic system diagram and any staging assumptions.

[25 marks]

#### Question 6

- a) What is meant by the term 'Risk Management' within a rail telecommunications environment? [3 marks]
- b) What process would you adopt in order to assess and document the technical and integration risks for a system? [8 marks]
- c) Provide an example of a Risk Register with the technical and integration risks for a system of your choice. [7 marks]
- d) As a designer, what measures would you implement in order to mitigate risk for the construction, operation, maintenance and disposal of your system? [7 marks]

#### Question 7

A major sub-surface railway station is being refurbished. All of the station telecommunication systems require renewal, and opportunities exist to make enhancements to functionality.

- a) Identify and explain the typical telecommunication systems required to support sub-surface railway operations at a major station. [5 marks]
- b) Draw a system diagram for the systems you identified in (a) [10 marks]
- c) What factors need to be considered when designing for sub-surface environments and why? [5 marks]
- d) What factors need to be considered when integrating a sub-surface railway station with adjacent premises (e.g. a shopping centre or mainline railway station) and why? [5 marks]

Paper continued on next page.

### Question 8

You are responsible for providing a replacement power supply system for critical railway operational telecommunications equipment.

- a) Describe your approach to equipment selection. Your answer should consider as a minimum:-
- i) System functional requirements
  - ii) Construction requirements
  - iii) Operational requirements
  - iv) Maintenance requirements
  - v) Disposal (end of life) requirements. [10 marks]
- b) What is a Failure Mode & Effect Analysis and how could this process assist in the provision of the replacement power supply system? [10 marks]
- c) When designing telecommunications power supply systems what measures would you consider to reduce the need for standby power supplies? [5 marks]

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