

**INSTITUTION OF RAILWAY SIGNAL ENGINEERS
2008 EXAMINATION**

MODULE 6 – COMMUNICATION APPLICATIONS

TIME ALLOWED – 1 1/2 HOURS

10 MINUTES WILL BE ALLOWED BEFORE THE START TO READ THE PAPER

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

With increasing use of radio communication for the running of the railway system, explain the basic principles and application of ONE of the following:

- a) Cab Secure Radio (CSR) used for train to signal box analogue radio system; or
- b) TETRA digital PMR system used for track to train communication; or
- c) Local or Spot analogue system used for shunting moves; or
- d) GSM-R. [15 marks]

What are the safety characteristics of the system you have explained? [10 marks]

Explain the difference between GSM and GSM-R. [5 marks]

Question 2

A new sub surface railway is being planned with 6 sub-surface fully enclosed stations approximately 3km apart. There is to be a centralised control for all train and station operations located 10km geographically from the nearest station.

Describe and explain, with the aid of sketches, all the telecommunications systems required for the safe and efficient operation of the stations. Your answer should describe how the systems will be controlled and operated from the main control site. [20 marks]

Describe how the effect of a failure of the transmission links will be minimised. [10 marks]

Paper continued on next page.

Question 3

A rural lightly used railway with 15 stations is to be provided with a low cost platform based customer information system.

Describe and explain, with the aid of sketches, options for a system based on the public internet. [15 marks]

What technology options would you consider for the telecommunications connections, both to the stations and to connect the station platforms together? [8 marks]

What ergonomic considerations must be considered and taken into account for disabled passengers? [7 marks]

Question 4

As the maintainer of the trackside copper cable distribution network, you have been asked to survey and test the cable to determine its suitability in supporting ADSL type data circuits that will form part of a major network.

Detail what information you will require from a survey and electrical test. [8 marks]

When undertaking electrical testing, what transmission and cable values would be considered acceptable? [10 marks]

How will the information you collect be analysed to determine whether the existing copper cable network will support ADSL circuits in the future? [6 marks]

Where the network just fails to meet the required specifications, what actions should be considered to upgrade the distribution network? [6 marks]

Question 5

Describe what is meant by EMC (electro-magnetic compatibility). [5 marks]

A new telecommunications voice switching system is being installed within a railway control centre. Discuss the potential EMC risks that may be present and suggest mitigation measures for each identified risk. [15 marks]

What tests should be undertaken to verify the suggested mitigation measures are effective? [10 marks]

Paper continued on next page.

Question 6

Describe what is meant by the term 'network management' within the context of the railway telecommunications network. [10 marks]

Discuss how the use of the following systems and equipment can support the overall network management process:

a) Intelligent infrastructure [10 marks]

AND

b) Remote condition monitoring. [5 marks]

Provide two examples of your choice that demonstrate the possible benefits of the introduction of intelligent infrastructure or remote condition monitoring within a railway environment. [5 marks]

Question 7

You are developing the functional requirements for the voice communications systems for an underground or main line railway control centre. Discuss the key operation and safety factors that you should specify within the system functional specification. [15 marks]

Discuss how you would evaluate a supplier's equipment proposal that does not fully meet the requirements of the functional specification. [10 marks]

Describe what tests you would undertake to verify that the equipment supplied complies with the requirements of the functional specification. [5 marks]

End Of Paper.