# INSTITUTION OF RAILWAY SIGNAL ENGINEERS
# 2017 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

You are responsible for the design of a copper cabling distribution network that will run approximately 2km along the side of a railway line to feed lineside equipment including telephones, alarms and signalling circuits.

Describe how you would go about designing a cable route to support this distribution network. Your answer should consider safety implications and state any assumptions made about ground terrain and operational requirements.

[25 marks]

## Question 2

a)      Explain each of the following terms related to public address systems:
         i)       Intelligibility
         ii)      Naturalness
         iii)     Acoustic feedback
         iv)     Sound Pressure Level
         v)      Reverberation                                                    [5 marks]

b)      Describe the factors you would consider when designing a new public address system suitable for an application within a large railway station.        [15 marks]

c)      Describe what tests you would undertake to demonstrate that the system meets its functional requirements.                                             [5 marks]

Paper continued on next page.

**Question 3**

a)	Explain what is meant by the term 'Remote Condition Monitoring' (RCM) and discuss the key factors that are driving railway organisations to consider RCM solutions.

[5 marks]

b)	For the purposes of RCM discuss the types of data and information that can be obtained and how these can be used by railway organisations.	[15 marks]

c)	What options would you consider for the transmission of this data to field maintenance engineers and management centres?	[5 marks]


**Question 4**

A railway station is to be provided with a driver only operated CCTV system (e.g. DOO / OPO) that allows the train driver to verify that the rolling stock train doors are clear and can be closed.

a)	Detail two design options available to convey the CCTV images to the train driver.

[15 marks]

b)	Describe how differing platform layouts may impact the design decisions.	[5 marks]

c)	What guidance would you provide to the testing organisation to ensure that the system is tested and commissioned in a way that minimises any impact to passenger service trains.	[5 marks]


**Question 5**

Provide an outline testing strategy for a railway station IP network which hosts CCTV, PAVA, CIS and the non-operational data network.	[25 marks]


**Question 6**

You are the designer on a project to design and install a new operational telecoms network to support both operational and non-operational data. You have been asked to undertake a high level design of the power supply arrangements required to support the telecommunications systems at a core node.

With the aid of diagrams, describe and explain your proposed power supply design. Your answer should include considerations for operations and maintenance.	[25 marks]

**Question 7**

A new radio-based train control system is to be installed on a high capacity railway (metro or mainline). You are the designer responsible for the selection and design of the radio system.

a) Propose and explain the principles of operation for your chosen radio system. [9 marks]

b) With the aid of diagrams, describe and explain your outline design for the radio network. Your answer should include an explanation of all engineering and human factors associated with your design. [8 marks]

c) With the aid of diagrams, describe and explain your outline design for the backhaul network. Your answer should include any considerations for operation and maintenance of both the radio and backhaul networks. [8 marks]


**Question 8**

You are responsible for the design and installation of a new CCTV system for a railway station.

a) Describe the scope of a survey to support the design and installation. [8 marks]

b) Describe the factors you should consider during the design phase, listing typical stakeholders that should be involved. [9 marks]

c) List the typical documents that should be produced along with a description of the typical content of each document [8 marks]


End of paper.