

**INSTITUTION OF RAILWAY SIGNAL ENGINEERS  
2009 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 mainline station requires a totally integrated customer information/public address system, platform specific radio system, CCTV, evacuation management, fire alarm and platform supervisory communications – all controlled from an office located in an adjacent building. The station consists of six surface platforms and six underground platforms. The tracks for all twelve platforms are electrified with 25kV overhead line.

- a) With the aid of a drawing, provide a design and technical description for the cabling of the station. [18 marks]
- b) Outline what type of cable you would use for each sub-system listed above and a method of installation for each type of cable. [12 marks]

**Question 2**

The installation of an integrated station management system in Mainline / Underground / Metro stations is becoming a modern day alternative to traditional monitoring systems.

- a) Prepare a design for such an installation (include a sketch) covering a station of your choice which includes a concourse area, underground and bridge installation (linking platforms), arrival / departure platforms, escalators, passenger lifts, ticket / travel office and external car park area. [15 marks]
- b) Outline the type of equipment you would use, the method of installation and environmental considerations. [10 marks]
- c) What additional factors would you consider to assist members of the public who are disabled? [5 marks]

Paper continued on next page.

### Question 3

You are involved in the design of a power installation associated with a new telecommunications equipment building adjacent to a busy 25kV electrified mainline railway. It is approx 500m from the nearest public highway and 500m away from a residential development.

The installation will include an electronic switch, SDH transmission equipment, GSM-R BTS, UPS, lighting, air conditioning and power sockets.

No railway power supply will be available for at least two years.

- a) With the aid of a block diagram, provide a design (not a circuit diagram) for the power installation within the building identifying any safety precautions that you would consider necessary. [9 marks]
- b) What options are available for obtaining a reliable, external power supply? Identify any design considerations that may be applicable. [9 marks]
- c) Outline a test and commissioning plan for the installation. [6 marks]
- d) What ongoing maintenance plans would you propose for this site? [6 marks]

### Question 4

You are planning to install a radio transmission site at a trackside location for train to shore communication.

- a) Describe the factors you should consider for:
  - i) The design phase
  - ii) The installation phase
  - iii) The maintenance phase [15 marks]
- b) Consider likely problems that may be encountered and the measures that should be taken to address these. [15 marks]

### Question 5

A project is to provide a large number of operator dispatcher systems for a train to shore radio system. These are to be located at a wide range of signalling control locations including mechanical signal boxes, control rooms, large panel signalling control centres and integrated electronic control centres.

Describe the factors that should be considered when undertaking the site survey at each type of location. Include in your answer the consideration of design, installation, commissioning, maintenance and disposal. [30 marks]

Paper continued on next page.

### **Question 6**

- a) What factors should you take into account during the design and building of a new cable route alongside a railway, and why? [10 marks]
- b) Identify options for the installation of the cable route and the reasons for your chosen solution. [10 marks]
- c) How might this differ for a railway with ac and/or dc electrification? [10 marks]

### **Question 7**

A railway administration has a telephone network consisting of a large number of TDM switches. It is planned to introduce a VoIP system into this legacy network.

- a) With the aid of a diagram describe all the component parts of a VoIP system. Include in your answer a description of how traffic can be connected to the legacy PABX and PSTN systems. [15 marks]
- b) Describe what is meant by TCP/IP and UDP, and why UDP is used for real time applications. [8 marks]
- c) Describe the advantages of VoIP systems compared to TDM circuit switched systems. [7 marks]

End of paper.