



# **IRSE Professional Examination**

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## **INFORMATION AND GUIDANCE FOR CANDIDATES**

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# 1. Introduction

You are advised to read the whole of this paper before embarking on your studies. It contains essential information on how to plan your studies. You must also read the Examination Regulations. The Regulations contain the rules that govern the examination and the procedures that you need to follow.

The examination is designed to test candidates' knowledge and understanding of railway signal and telecommunications principles and practices. Candidates are expected to be able to demonstrate their ability to exercise professional judgement in the preparation, assessment, amendment or application of specifications and procedures. The examination is applicable to personnel engaged in the following activities:

- Signalling / Telecommunications principles, practices, rules and regulations for the safe operation of railway traffic.
- Design and development of Signalling / Telecommunications equipment and systems.
- Preparation and understanding of equipment drawings and specifications and / or design.
- Planning, site installation and testing of Signalling / Telecommunications equipment and systems.
- Practices related to assembly, wiring and testing of Signalling /Telecommunications equipment and systems.
- Maintenance and servicing of Signalling/Telecommunications equipment and systems.

In order to meet the examination requirements for corporate membership, candidates must obtain a pass in Module 1 plus three of the optional modules. There is no maximum time between the first and last pass.

The examination is intended to test the main concepts of the subject material without bias to the practice of any one railway administration or country.

## 2. Applying to take the Examination

### 2.1 Deciding which Modules to Take

Up to four modules may be taken in one year (though few candidates do so). The topics of different modules are to some extent interdependent, so you should consider carefully the combination of modules that you intend to take. For example, Module 2 and Module 3 both involve knowledge of signalling principles. Similarly, Modules 3 and 5 can usefully be studied together, as the same general topic can be viewed from the perspectives of "broad general principles" and "application to a specific site implementation". Similar considerations apply to Modules 4 and 6.

### 2.2 Exemptions

It is possible to obtain exemptions from individual modules, with the exception of Module 1. To obtain an exemption, you must demonstrate that you have passed an examination by a recognised institution, which substantially covered the syllabus of the relevant IRSE examination module. Due to the specialised nature of the IRSE Examination, the scope for exemption is fairly limited.

For example, the most commonly sought after exemption is for Module 4. Exemption is often requested on the grounds that Telecommunications has been part of the candidate's degree course. The IRSE Council is not convinced that such study justifies module exemption for the following reasons: 1) the content of the Telecommunications element within a typical university engineering degree is at best a basic overview and, 2) where

students study a Telecommunications topic for their final year project, these tend to focus on too narrow a field of specialisation.

As a basic guideline, therefore, please do not ask for exemption from this module unless your study has been predominantly in Telecommunications.

All claims for exemption must be made within five years of obtaining the particular qualification for which recognition is being claimed. Once an exemption is granted it will always remain 'current'.

See "Exam equivalents/alternatives" on the IRSE website for qualifications that may provide exemption from the entire examination.

### **2.3 How to Enter for the Examination**

The examination is held in October of each year. If you intend to sit an examination in the forthcoming October, you must apply online via the Membership area of the website (having first logged on as a member). Please bear in mind that the deadline for submitting applications is 30 June. Before this, you will need to find an IRSE member to sponsor your application and submit a Sponsor's Declaration Form by 30 April, so you need to start your preparations no later than February. Read "Applying to take the IRSE Professional Examination - Guidance for Candidates and Sponsors" on the IRSE website (Membership area) for details.

In order to apply to sit an examination, you must already be a fully paid-up member of the Institution at any grade.

The location of examination centres does vary according to demand, but they have generally covered the following localities: UK, (Bristol, Birmingham, London, York, Glasgow), Australia (NSW), Australia (WA), Australia (Queensland), Hong Kong, India (Bangalore), India (Secunderabad), Singapore, Thailand and United Arab Emirates. If there is no examination centre in your country, depending on the demand, one may be established. Please contact the London office if you would like to sit the examination in a country other than those listed.

## **3. Planning your Studies**

### **3.1 General Guidance for All Candidates**

Having decided which modules you wish to take, it is very important that you plan your study time. Do not underestimate the preparation time that you will need.

In particular, if you decide to take four modules in one year, you should be aware that this will necessitate a considerable amount of concentrated study. If you doubt that you will be able to find the time needed to prepare for four modules, you should spread the modules over a longer period. It is important to be realistic when estimating how much study time you will have.

The purpose of the examination is to demonstrate that your technical knowledge of Signalling and Telecommunications in a railway environment has reached a professional standard. Last minute revision is unlikely to be successful.

Map out your study objectives for the period between now and the date that you intend to sit the examination. Study the exam syllabus in detail, while considering your own strengths and weaknesses of knowledge and experience. You should then be able to determine where extra preparation is required.

Discuss with your sponsor, mentor, or another qualified engineer whose opinion you value, how to improve your knowledge in your areas of weakness. Maybe there is a specific work assignment, which would be of benefit. Give yourself milestones to be achieved in each month leading up to the examinations.

Further advice on studying techniques, for candidates who do not have recent experience of studying for an examination, can be found in Appendix A of this document.

### **3.2 Specific Advice on Studying for the IRSE Examinations**

***- this section is intended for all candidates and gives information on what the examiners are seeking and on where relevant study material can be found.***

You will be asked to evaluate material and to discuss the relationship between various theories and practice. In so doing, you will need to actively think about the material and use it to answer the questions. There is no single text book for any of the modules. The Study Guides are intended to direct your study - not to be a comprehensive source of facts. They should be used alongside other resources. A list of Study Resources can be found in Appendix B of this document.

You will have a choice of questions in most modules to allow for the fact that candidates will not know all parts of the syllabus equally well. For a three question paper, you will be wise to prepare six or seven topics thoroughly with two or three in reserve. But do not completely ignore other topics because an understanding of one part of a syllabus is almost always dependent on an understanding of the other parts. Also do not try to guess which questions will appear. If for example, a topic happens to appear in an exam for three consecutive years, this does not mean it will also appear in the fourth year.

It is worth studying past reports/webcasts of the annual IRSE Exam Review; these provide an analysis of the candidates' performance in the previous examination.

### **3.3 Practice Questions and Mock Examinations**

Once you have studied all the material and made your own revision notes, it is time to practise doing previously set examination questions with reference to your notes. Past examination papers together with some sample answers are available from the members' area of the IRSE website.

Later on, you should not use your notes, but should test yourself. Four weeks before the exam, select one set of past papers (which you have already seen) and try to answer them under exam conditions on a timed basis. The following week, answer another set of papers which you have never seen before (saved previously for this purpose).

Go through what you have written and test its grammar, style, reasoning and logical cohesion as well as its accuracy, then read through your notes and see what else you could have included. Ask your sponsor, mentor or other qualified engineer to give you a critical review of your work.

You will find some questions that are best answered by including one or more diagrams. This is an exam in an engineering discipline and good diagrams are an essential part of engineering. Identify some of the useful ones which you might have the opportunity to use and practise drawing them quickly and legibly.

Examination preparation by answering past questions under exam conditions gives you the opportunity to practise your exam technique. One approach is described below, but develop a method that works for you.

- a) **Decide which questions to answer.** Before you answer any questions, read the exam paper and plan your time in proportion to the marks available. Where choices are available, select the questions that you are going to answer. Plan your time so that you are able to answer the required number of questions and do not exceed the allocated time for each question. Attempt to answer **all** questions. By not answering the required number of questions you substantially reduce your chances of passing the exam. Once you have selected the questions that you are going to answer, there are four more stages to consider:
- b) **Decide what the question means.** This is where marks are often needlessly lost. The exam committee goes to considerable trouble to rule out, as far as possible, any ambiguities in the questions and it is essential that you make quite sure that you understand exactly what question is being asked, then answer it. Don't answer a related question somewhere near the topic or the question that you wish had been set; you will not gain marks.
- c) **Jot down your main ideas onto paper into note form.** It is a common fault amongst candidates to look for 'the right answer'. Very often there is no exactly right answer to a question; merely a range of topics, ideas or calculations which ought to be included in the answer. It is therefore essential that your answers are clear, concise and well reasoned. You also have the opportunity to put this information in its wider context but this must not be at the expense of the primary answer to the question.
- d) **Turn these notes into the planned outline of your answer and allocate so many minutes to each, taking into account marks for each question.** As far as possible the questions set are judged to take an equal time to answer. Don't be misled into thinking that a short question requires a short answer. Some of the best questions consist of only a few words because they allow you to structure the answer to best advantage. Answer all parts of the question, as marks are available for each part.
- e) **Write your answer summarising in your opening paragraph the structure of your argument.** Always make sure that your answer states any assumptions you want to make about railway authority safety standards, operating standards, signalling principles, signalling practices, circuit design standards, equipment choices or standard technologies from which you are quoting.

### 3.4 On the Day of the IRSE Examination

Make sure that you know exactly where the examination centre is located, at what time you should arrive and the exact time each paper will start. This is particularly important if the location is one which you are not familiar with. The examination normally takes place on a Saturday (Friday in Australia), so remember to check for possible travel diversions or different security arrangements for access to the examination premises.

Check that you have all the equipment that you might require during the exam. It is advisable to take duplicate black pens, pencils, scale rules, rubbers etc. and a spare calculator (non-programmable or database type) with new batteries. Templates for circles and flow-charting are very useful as they enable neat diagrams and charts to be drawn very quickly, but do not bother with excessive neatness.

The purpose of the exam is to communicate ideas. Although poor handwriting is not penalised, you are likely to get better marks if your handwriting is legible, simply because the examiner can read what is written.

The first ten minutes of each paper should be a 'reading and thinking' period. This will enable you to:

- **read the instructions carefully** and make sure that you know how many questions you are expected to answer. You must answer the required number of questions. Failure to answer a question will result in no marks at all for that question.
- **read all the questions carefully** and decide which ones you feel most competent to answer. One major criticism from the Examination Committee is that many candidates do not read the question carefully, or they fail to understand the question. The response to each question must be based on the syllabus of the relevant module and the scope of the particular question. The scope is embedded in the precise wording of the question. Be careful to observe any constraints within the wording, but where it is non-specific be careful to interpret as widely as possible so as not to over-constrain your answer and thus only address part of the issue.
- **plan exactly how long you are going to spend on each question.** Good time management is crucial as the time available is very limited; do not spend too long on any one question. Ensure that your time allocation within a question is proportionate to any hints that are given (e.g. the relative markings between the various portions, words such as "*brief*" etc). Little bits of answers dashed off in the closing minutes rarely add significantly to your marks. You will benefit more by planning to leave a few minutes to read each question through carefully and correct any mistakes. If you recognise that the answer to a question is not correct, but do not have time to correct it, make a statement to that effect. The recognition of your error will be taken into account by the marker. You may wish to leave spaces throughout the answer to add any after thoughts, clarifications or definitions.
- use the remaining time to plan how you are going to structure the answer to your first question.

When choosing which examination question to answer, make sure that you are confident that you can give a professional answer and that you answer the questions in the context of the paper. For example, questions in Module 3, Signalling Principles, need to be answered in relation to signalling principles rather than concentrating on applications. Don't forget to add a few lines of explanation when answering questions that require calculations.

Remember that the ultimate purpose of the exam is to give you the opportunity to demonstrate that you are able to take a professional engineer's approach and to set your knowledge in its wider context. Your answers should demonstrate that you possess the relevant underpinning knowledge, can provide reasoning for your answers, show your operational railway competence, and your ability to apply your skills, knowledge and experience through worked examples. Whenever there is a borderline decision to be made, one of the questions asked is whether the candidate has demonstrated a professional understanding of the subject matter. Examiners like passing candidates - help them to help you!

### 3.5 Examination Rules and Technique

Rules on answering the examination papers will be given at the start of the examination, but candidates should bear these regulations in mind while studying, in order to avoid making incorrect assumptions about what is permitted in answers.

All the answer papers are photocopied so it is essential that you do NOT use colours in diagrams. Instead use different line thickness or styles and print sizes if you need to.

You MUST begin the answer to each question on a separate piece of paper. Apart from the module number, the question number, your candidate number, the sheet number and the total number of sheets do NOT write anything else outside the box on the answer paper. Anything written outside the box could be missed by the photocopier.

If it is necessary to answer on a piece of paper that is not IRSE answer paper, e.g. graph paper, the module number, the question number, your candidate number, the sheet number and the total number of sheets must be written on it.

Too many candidates fail to number each of their answer sheets. This is an important protection against any of your sheets being lost by the invigilator or in the copying process.

The exam is set in English and answers are required in English, however the Examiners do recognise that English is not the first language for some candidates. While no marks are deducted for incorrect grammar or unusual use of vocabulary, it is expected that your answer will provide a clear explanation of what you mean. Questions will only give metric dimensions and figures, and the use of imperial measurements in answers will not be accepted.

In any answer, which includes calculations, always set out the full workings so that your thought process is shown clearly. The exam committee understands that in the pressure of an exam, errors creep in which you would not normally make. If your workings show that you have arrived at an incorrect answer solely because of an arithmetical error or because you have manipulated an equation incorrectly, you will still be given full credit for setting out the principles involved.

Do not assume that the Examiner knows what your favourite abbreviations stand for. A professional approach means that you always write the abbreviation out in full and put the abbreviated version in brackets following it, the first time it is used, e.g. As Low As Reasonably Practicable (ALARP). You can then use the abbreviation freely throughout the rest of the question, but you should define it again in any subsequent question. This is necessary because questions are often marked in a different order to that in which they are written, so each answer must stand on its own.

If the question calls for a diagram or sketch then you must include one, or you will lose the marks that have been allocated to it. Even if the question does not specifically call for a diagram or sketch, it is well worth including one if it will explain your ideas better

Look for the guidance words in the question which indicate what the examiner is expecting. For instance "briefly" means a few sentences or bullet points, and normally has only a few marks. "Discuss" expects you to examine scenarios, looking at the issues and may also be accompanied by words like "advantages/disadvantages". "An example you are familiar with" is normally there to give the examiner an insight into the railway system you know well, so add phrases such as "On Indian railways, ..." since this gives context to your answer.

Please note the questions are designed to be answered following the principles and practices of any railway organisation (whether heavy rail or metro) and anywhere in the world. You are expected to answer in the context of a railway organisation with which you are familiar. You should specify in your answers which railway practice you are using. This is a particular necessity for answers to papers involving Signalling the Layout, Control Tables and Aspect Sequence.

Candidates come from a number of different railways and it is therefore essential that assumptions are stated. One of the greatest sins (usually by UK candidates) is to state that the answer to a given question lies in a quoted standard (e.g. "see SSP 34" or "see CENELEC prEN50129"). It is good to show that you know the need for standards, but you should state the principle that is contained in the standards, and be critical of them if appropriate.



Every year the examiners report back that it is obvious that many candidates have not read the question carefully, or have chosen to answer the question they would have liked to have been written. Also, it is important to read the whole question before starting to answer it - quite often subsequent sections will build on your answer for the first part, so make sure you choose your early answers with the latter parts in mind.

## Appendix A

### General Study Techniques

***This section is intended to aid candidates who do not have recent experience of studying for an examination.***

You will need to plan how to integrate your studies with your normal working life. To do this you will need to have a clear idea of how long different activities take. How long does it take you to read a given number of pages? How much additional time do you need to make notes? At what time of day do you work best? How easy do you find it to write? How much time do you need to plan what you are going to say?

Measure and plan what you intend to do and constantly review your progress. You will benefit from discussing your difficulties with other candidates, if that is possible. They will almost certainly be experiencing similar problems!

It is helpful to establish a studying routine e.g. are you able to study at the same time of day. It is a mistake to try to do too much in one session, as a certain amount of time is needed to allow you to absorb knowledge. Recreation time is also needed to keep you alert.

If there are periods where it is not possible to study, you need not be discouraged as long as they are not too prolonged or too frequent.

Find a place where you feel most comfortable and alert to study. Adequate light, freedom from noise and interruptions, a good working surface, easy access to books and files and the facility to leave them in place during breaks will all help you to make the most of your study time.

The most important point about your reading is that it should be active rather than passive. It is not enough to simply learn facts and then reproduce them on the exam paper. There is no substitute for making your own notes of key concepts, techniques, issues, arguments and references. Taking what you think is important and putting it into your own words is a powerful means of acquiring and developing your knowledge of a subject.

Essentially what you are doing is drawing on your existing ideas and knowledge in order to assimilate new facts and ideas. For this reason, the actual process of note taking is at least as important as the final product.

The following points should help you when note taking:

- use your own words, copying text does little to help assimilate knowledge
- be selective in what you record, only brief salient points should be noted
- set out your notes to reflect the structure of the material that you are studying and the relationships between concepts
- underline or highlight key words
- your notes should be able to convey accurately the key concepts of what you have studied when referred to three or four months later on.

After finishing a block of reading, try to discuss it with other people who have previously sat for the exam. This will give you essential absorption time during which you can think the topic over for yourself and relate it to everything else that you have studied. It will also crosscheck your understanding. Never feel embarrassed about asking questions, even if you think that they may sound trivial.

## Appendix B

### Study Resources

The following resources exist to help you to prepare for taking the examinations. Some of these are only available to IRSE members (of any grade) who have registered for website access. Those in **bold** are considered to be essential.

- **IRSE Examination Syllabus (see Membership area of IRSE website)**
- **Study Guide for each module (see Membership area of IRSE website)**
- **Suggested Reading List for each module (see Membership area of IRSE website)**
- **Complete copies of previous papers (see Membership area of IRSE website)**
- **Sample answers for selected past exam questions with examiners' comments (see Membership area of IRSE website)**
- Study Groups (see Membership area of IRSE website for a list of known groups and also for a Good Practice Guide for setting up your own group)
- Younger Members (YM) Exam Study Days (publicised on IRSE Exam Forum and by email to those on YM distribution list)
- **Annual IRSE Exam Review (attend in person (London) or see presentation slides under "Technical Papers Webcasts" on IRSE website)**
- IRSE Exam Forum (an independent website for sharing and networking)
- Proceedings, conference papers and webcasts etc. (see Knowledge area of IRSE website)
- IRSE News (see Knowledge area of IRSE website) – Examiners sometimes choose topical subjects when setting questions.
- IET Library at Savoy Place, London, for UK candidates
- Information accessed via internet search engines (but be aware that some websites are more reliable than others)
- The IRSE member who has agreed to sponsor your application to take the examination (or other mentor)