



## Institution of Fire Engineers Examinations 2007.

### Chief Examiner's Report.

***This report on the IFE's examinations held in March 2007 was compiled by the Institution's Chief Examiner, Dr. J. A. Marsden, based upon individual reports submitted by the members of the Examinations Committee.***

It is my pleasure as the Institution's Chief Examiner to present the report for the IFE's examinations which were held around the world in 98 examination centres during March 2007.

The purpose of this report is twofold:-

1. To provide a concise yet general summary of candidates' responses to the questions they answered across the range of papers offered.
2. To help prepare future candidates for their attempts at the Institution's examinations.

In reading this report, prospective candidates should bear in mind the following points:-

1. These comments are necessarily general. There is not space in the report to refer to the different variations in knowledge and understanding evident in individual answer scripts during the marking process.
2. Although this report does contain details of examiners' "suggested answers", these details do not represent a full or complete answer and are intended primarily to illustrate the comments being made about the type and quality of answers submitted by candidates.
3. Every examination answer is considered on its merits. In fulfilling their professional role, examiners must provide a series of suggested answers to the examination questions they set. However, these suggested answers do not preclude credit being awarded for other accurate, relevant knowledge and comment given by candidates.
4. For the examinations in 2008, we have included information and advice on preparing for examinations. (To download this document on the IFE website, please use the following hyperlink:- [http://www.ife.org.uk/docs/Study\\_Skills.doc](http://www.ife.org.uk/docs/Study_Skills.doc).) This document gives advice on methods by which candidates can avoid losing marks in future examinations. Typically, candidates lost marks in the examinations of 2007 in one or more of the following ways:-

- ? **Lack of preparation.** A number of candidates wrote several answers that merited pass marks, but as they had not covered the syllabus thoroughly enough, the rest of their answers did not reach the same standard.
- ? **Lack of relevance.** Many candidates wrote down all the information they had learned on a particular topic without applying this information to the wording of the question. The guidance advises candidates to ensure the information they write down is relevant as well as accurate, and that their knowledge must be applied in the way that the phrasing of the question demands.

- ? **Lack of planning.** Some candidates lost marks by writing down unplanned and rambling answers. It is important to organise thoughts and structure answers before writing essays in an examination. Even a brief plan will help achieve this. As with many tasks or projects, the more methodical and systematic candidates are when approaching examinations, the more likely it is that they will be successful.
  
- ? **Poor time management.** Candidates should manage their time properly by dividing the time available for the examination evenly among the questions so that each one can be answered carefully and thoroughly. This is especially important where candidates find one examination paper particularly difficult. Then it is all too easy to take too long on the first four or five questions, leaving little or no time for the final answers. This compounds the difficulties a candidate is already experiencing, and it makes failure more likely.

I would like to reassure all IFE members that in marking the Institution's examinations this year, as in previous years, the examiners were meticulous with regard to accuracy, consistency and objectivity. The examiners are unpaid volunteers and they conducted themselves in a professional manner. They performed their duties with credit to themselves and to the Institution itself. I extend my thanks to them and to the IFE staff who gave their expertise and energy to making the whole undertaking possible.

**J. A. Marsden BEng CEng MinstE FIFireE**

**Chief Examiner.**

## Membership Examinations.

### Paper 1: Fire Engineering Science.

#### **Question 1.**

*Water is flowing through a tube which tapers from 100mm to 80mm. A pressure gauge at the 100mm opening measures  $202\text{kNm}^2$ . The velocity at this point is  $5\text{ms}^{-1}$ . Calculate the pressure at the 80mm point.*

The Bernoulli equation was in the majority of cases very well answered, with candidates generally providing diagrams and demonstrating clear working. However in some of the answers supplied clear working was not shown and as a result only a modest mark was awarded.

#### **Question 2.**

*Sketch the fire growth curve as a function of time and temperature and comment on the following:-*

- a. *the growth stage*
- b. *pre-flashover*
- c. *flashover*
- d. *decay*
- e. *fuel and vent control conditions*

This question was generally well answered by those who attempted the question. In the majority of cases the answers were of a good standard. However, disappointing answers were also given to the final part of the question.

#### **Question 3.**

*Discuss the behaviour of glazing systems when involved in fire, commenting on fire resistance and the effects of heat.*

This was poorly answered by the majority of candidates. The question clearly asked candidates to **discuss the behaviour of glazing systems** involved in fire. Generally, candidates gave vague descriptions about the types of glass but very few actually described the action of fire on glazing systems.

#### **Question 4.**

*Discuss fully the extinguishing actions of fire fighting foams when used on flammable liquids.*

This question was poorly answered by the majority of candidates who attempted the question. The extinguishing actions of foams were clearly not understood by the majority of the candidates and marks were not given for lists of the different types of foam or descriptions of their application.

#### **Question 5.**

*Explain the hazards of static electricity in industrial processes and outline the safeguards to reduce its effects.*

This question attracted a high mark by the candidates who attempted the question and generally candidates answered the question fully and gained a satisfactory mark.

#### **Question 6.**

*In relation to explosives, briefly explain the explosive divisions and comment on their effects upon fire fighting actions at explosive stores.*

This question was only attempted by a small number of candidates who in gave very good answers. However, some candidates confused **divisions** with **classes**, for which no marks were awarded.

**Question 7.**

*Explain fully the methods by which toxins can enter the body and outline the protection measures to be taken by emergency response personnel.*

This was a very well answered question with the majority of candidates attracting high marks, although in outlining the protection measures some answers lacked depth.

**Question 8.**

*With the aid of diagrams, describe fully the advantages, disadvantages and operating principles of:-*

- a. *ionisation detectors*
- b. *optical detectors*

Generally the question was well answered by a high number of candidates. Despite being asked for **diagrams** many candidates gave long **descriptions** of the types of detector when a diagram would have answered the question just as well.

**Paper 2: Fire Safety.****Question 1.**

*You have been asked to provide advice about the safe use of medical oxygen. Detail the information you would give.*

This question was answered reasonably well, with many candidates displaying a good level of knowledge. Many did not adequately explain the characteristics of oxygen and the dangers it posed. Most concentrated their examples around large medical facilities in hospitals, it was hoped that more would have considered small scale domestic use.

**Question 2.**

*Fires are common in buildings undergoing refurbishment or alteration. Detail the management issues to be considered and the precautions necessary to reduce the likelihood of fire in an occupied building.*

This was a popular question that was often misread. Many candidates missed the statement 'occupied building' and only considered issues on a construction site. Most candidates were aware of 'hot work' permits but very little else of substance. Candidates did not answer their questions from the view of a manager having to balance the construction work with the need to maintain the means of escape for the buildings occupants.

**Question 3.**

*What measures can be introduced to reduce the threat of arson in school premises?*

This question was popular with many candidates and a number of good quality answers were received. Many candidates gave a very limited answer. An 'increase in security' was considered to be just one aspect, however many candidates concentrated almost entirely on this giving a whole range of security options and consequently failed to attract many marks.

**Question 4.**

*There is often a conflict between the need for security and the requirement for means of escape. Discuss the problems that can arise in situations where this conflict exists.*

Generally, candidates talked about security and then about means of escape. In the majority of cases they failed to **discuss** the conflict between the two.

**Question 5.**

*Discuss the issues involved in using lifts for the evacuation of buildings.*

For the most part, candidates failed to answer this question well. Many candidates simply dismissed the use of lifts for evacuation and there was little discussion. Having dismissed their use they then went on to list basic requirements of a firefighting lift.

**Question 6.**

*Describe the training requirements for hospital staff who will be responsible for the safety of patients in the event of an outbreak of fire.*

Some candidates had obviously read the relevant literature and gave a comprehensive answer. However, many candidates did not achieve this. Given that this question was asked at member level it was surprising that some candidates listed very basic fire safety advice that should be given to hospital staff and judged that to be sufficient.

**Question 7.**

*Describe the problems that might arise from providing the means of escape across a roof into an adjoining property.*

This question proved popular but the number of good quality answers was disappointing. A relatively common sense approach to some of the hazards that could be encountered would have secured a good score. Some candidates merely dismissed the use of roof top escapes although they are widely used and accepted throughout the world.

**Question 8.**

*You are tasked with commissioning a new building. Describe the key fire safety measures involved in this process.*

Many candidates did not understand the term 'commissioning' and ended up writing quite long scripts detailing various fire safety measures that should be incorporated into a new building at design stage. Those who did understand the term generally received a high mark in what was a relatively straightforward question.

**Paper 5: Human Resource Management.****Question 1.**

*Discuss the factors within internal and external operating environments that influence strategic planning.*

This was a well answered question with most candidates using the PESTEL (political, economic, social, technological, environmental and legal) analysis in the external environment and using the SWOT (strengths, weaknesses, opportunities and threats) analysis for the internal environment.

**Question 2.**

*Describe a process for measuring organisational performance against operational targets.*

This was not a well answered question. Few candidates described any kind of **process**, preferring to base their answers on the words **performance** and **targets** contained within the question. The question required the candidate to describe a process based on extracting the relevant information relating to performance, matching it with target criteria and key performance indicators, and analysing this data to determine actual measurements over a defined period, identifying areas of both successful and unsuccessful performance, etc.

**Question 3.**

*What factors should you consider when implementing organisational change?*

This was a popular question with good marks achieved when candidates adopted a logical approach to the question. Most candidates considered consulting with all those involved and planning the change, but few expanded their answers to include factors like identifying the obstacles to change and devising strategies to overcome these obstacles by making a clear persuasive case for improvements, communicating, etc.

**Question 4.**

*Summarise and comment on accepted best practice for assessing the performance of teams and individuals.*

Most candidates focused on what a team is rather than commented on assessing the performance of teams and individuals. This question was generally poorly answered.

**Question 5.**

*Outline the elements of a personal development plan for the continuous improvement of personal performance.*

This question was not well answered, with most candidates outlining the **general improvement of performance** within an organisation while the question required candidates to outline **continuous improvement of 'personal' performance**.

**Question 6.**

*You have been given a project to manage. Discuss the steps you would take to agree the project's scope and definition.*

The candidates who took a systematic approach to answering this question by presenting the information required without repetition or omission gained the most marks. The question required the candidate to discuss such areas as clarifying the project goals, benefits, constraints, quality and success criteria with the sponsor, identifying the contingencies and risks associated with the project and assessing the projects feasibility, negotiating any necessary amendments, etc.

**Question 7.**

*Discuss how variations in working hours may contribute to recruitment and retention, particularly with respect to under-represented groups.*

This was not a popular question and was not well answered by those who did attempt an answer. Most candidates focused purely on recruitment and did not discuss how variations in working hours may contribute to recruitment and retention, particularly with respect to under-represented groups.

**Question 8.**

*Describe in detail the role of managers in the training and development of their staff.*

This was a popular question which was well answered. The candidates who were not awarded high marks provided **general information on training and development** within an organisation rather than describing the **'role' of a manager in the training and development** of personnel, which was what the question asked for.

**Paper 6: Fire Service Operations.**

**Question 1.**

*Summarise the main features required by command and control systems used at incidents, with particular reference to the roles of the principal officers.*

Several candidates wasted time detailing every possible officer at an incident. Many candidates discussed communications and risk assessment but did not focus on the core element of control at incidents. There was a general failure to discuss the principles of command and control in general terms, little discussion of the spans of control, the need for a system or the problems of free lancing. Candidates must remember that the IFE is an international body and should refer to the **principles behind systems** rather than trying to **describe a system** in place in their country.

#### Question 2.

*You are called to a derailment involving a passenger train in a rural location. Discuss the factors you would need to consider with particular emphasis on rescuing the passengers.*

Candidates that scored good marks detailed the need to provide the exact location of incident, the types of train involved, access points, the establishment of a rendezvous point, the establishment of a carriage clearance system, casualty recording and the difficulties of gaining access to rail carriages. They then went on to briefly discuss the above points. Candidates who did badly spent too little time on the above but concentrated instead on the need for high visibility jackets and railway warning horns.

#### Question 3.

*With reference to ventilation at fires:-*

- a. *Describe the different types of ventilation.*
- b. *Explain the purpose(s) of ventilation.*
- c. *Discuss the operational considerations involved.*

Some candidates wasted time discussing **ventilation in general**, and not, as required, **ventilation at fires**. They tended to show a poor understanding of lateral ventilation. However most had a good appreciation of the purposes of ventilation at fires, but several failed to discuss the operational considerations and the potential dangers of ventilation. Many candidates did not appreciate the precautions that could be taken to mitigate these problems.

#### Question 4.

*Describe the systems available for identifying dangerous substances in transit, particularly those in bulk. Discuss the relative effectiveness of these systems.*

Few candidates attempted this question and fewer still scored good marks. To achieve a high mark it was necessary to **discuss the relative merits and problems** of the various systems in use. Most of those attempting this question thought that it was satisfactory to **describe one or at best two systems**.

#### Question 5.

*With reference to the stability of ships:-*

- a. *Describe the factors that affect their stability.*
- b. *Explain the consequences of fire fighting operations on the stability of ships.*
- c. *How can stability be maintained or improved during fire fighting operations?  
What are the merits of the different methods that may be used to achieve this?*

There was a general failure among candidates to explain the importance that the position of weight has on a ship's centre of gravity and therefore its stability. No candidate mentioned effective beam, deck immersion or bilge emersion and their potential effects on stability. Few mentioned the problem of free surface effect and the potential to combat it by use of longitudinal bulkheads or by a total flooding of the compartment. There was no comment made on the difference between a **list** and a **loll**.

#### Question 6.

*You are called to manage an incident where a military aircraft has made a forced landing on farmland.*

- c. *What is your assessment of the dangers this situation presents?*
- d. *How would you rescue the pilot and maintain the safety of your crew?*

To achieve a good mark candidates needed to show an appreciation of the wider incident. Many focused only on the aircraft, and few were aware of hazards that could be encountered on approaching the aircraft, particularly if the approach was near to the line of the forced landing. The problem of grassland fires was not generally considered. Several answers contained references to the danger from ordnance on the aircraft, but did not refer to modern aircraft carrying bombs or having external fuel tanks and the probability that they would be in the area along the crash route. Most were aware of the dangers from canopies but failed to ensure that the ejector seat was made safe.

#### **Question 7.**

*You are mobilised as the incident commander to an urban location where a chemical explosion has occurred. Give a summary of the plan you would put into operation with particular reference to the following considerations:-*

- a. *Control.*
- b. *Risk assessment.*
- c. *Logistics.*

Those candidates that achieved a high mark appreciated that an explosion in an urban area was likely to cause a major incident requiring the co-ordination of organisations outside the normal emergency services and also the possibility that the explosion may be the result of a terrorist act. Most discussed the need to establish a control point but missed out on some marks by not accounting for the location of this and other services controls. Whilst several considered the problems of evacuating large numbers there was no discussion of the option of people staying indoors unless instructed to move. Several major problems were ignored, such as casualties self reporting to local hospitals, and the need to control egress through triage.

#### **Question 8.**

*Describe the impact of fires upon the environment. Discuss the effectiveness of control measures that can be used to limit the environmental damage caused by fires.*

Candidates did not define the term **environment** as a starting point, consequently they concentrated on acute damage to the natural world and failed to consider the cumulative effect of small fires such as car fires. Many missed the point that this is an international problem, with carbon dioxide release adding to the greenhouse effect and disasters such as Chernobyl spreading far beyond a country's borders. The problems of cheap "disposable" buildings were overlooked as was the problem of job losses caused by fire. Generally, candidates failed to discuss the problems of containment or the option to let a fire burn in order to destroy toxic material.

**Generally, in answering this paper,** candidates failed to read the questions properly and so they did not answer directly the questions that had been asked. It was also evident that some candidates, in attempting examination questions, did not understand the difference between the terms **discuss** and **describe**. Some candidates gave very brief answers: in such cases, high marks cannot be awarded where answers lack detail or substance. In addition, candidates should understand that as an international body the Institution rewards answers that are widely read rather than those that recite local practice.

### **Paper 7: Aero Fire Studies.**

#### **Question 1.**

*What types of official and personal documentation may be found at the scene of an aircraft accident? What should be done with them?*

This was a popular and well answered question. Generally, candidates would have scored more marks by answering the question directly: it clearly asked for details of official and personal documentation, not descriptions of the black box or cockpit voice recorder, etc.



**Question 2.**

*Explain in detail the concept of critical area and control.*

This was a popular question and one that was generally very well answered. Candidates would have been awarded more marks by providing a diagram.

**Question 3.**

*Discuss the term Dynamic Risk Assessment in relation to incident command at aircraft emergencies.*

This proved to be an unpopular question with candidates, with many of the failing to understand that dynamic risk assessment is an **ongoing process** of risk assessment at an aircraft accident. It starts from the initial stages, progresses through the development stage and concludes finally with the closing stage.

**Question 4.**

*Describe the classification and protection of aircraft hangars.*

This question was popular with candidates, and generally they answered it well. On the whole, candidates provided enough evidence to demonstrate that they had read and understood the relevant material.

**Question 5.**

*With reference to **one area of your own choice**, outline the relevant training requirements for rescue and fire fighting personnel.*

This question was something of a “gift”, affording students the option to outline any training area of their choice. Oddly, it turned out to be an unpopular question: however, the students who attempted this question scored reasonably good marks.

**Question 6.**

*Describe Critical Incident Stress in rescue workers and the methods used to minimise its effects.*

A popular question with candidates, but not a well answered one. The main criticism was that students did not understand the term **critical incident stress** and confused it with **post traumatic stress disorder**, the difference being that the former is a short term condition, while the latter has long term effects.

**Question 7.**

*Describe the physical and biological hazards that may be present at an accident crash site.*

A popular question with candidates, who understood the physical hazards at aircraft accidents but failed to mention the biological hazards, such as typhoid, H.I.V., A.I.D.S., meningitis, hepatitis A, B or C. In examinations at Membership level, candidates need to enhance their studies by gaining access to a wider reading base.

**Question 8.**

*Define and discuss the following terms in relation to heliports:-*

- a. *transitional surfaces*
- b. *obstacle limitation surfaces.*

This was a popular question with candidates, yet on the whole they failed to supply enough evidence of the understanding of a complex topic. This was surprising as most provided a very good diagram: however, they generally failed to explain it in sufficient detail.

## **Paper 8: Fire Investigation.**

### **Question 1.**

*It is widely believed that a large number of fires are incorrectly determined as being of electrical origin. Consider why this might occur.*

This question was poorly answered in general. Candidates appeared to lack a basic understanding of the circumstances required for a fire of electrical origin to occur. Consideration was not given to explain the nature and likelihood of the fault required or the capability of the fault to ignite a fuel package. There was very little explanation of how and why mistakes could be made.

### **Question 2.**

*Explain the process of the ignition source known as spontaneous combustion and the circumstances required for it to occur.*

This question was relatively well answered, but again some candidates did not answer the question directly, with a number of them trying to explain Spontaneous Human Combustion. The better scripts were awarded additional marks for **detailed explanations** rather than a **general description** of the phenomenon.

### **Question 3.**

*Describe the following forms of combustion commonly encountered by fire investigators and give an example of one fuel package associated with each:-*

- a. *smouldering combustion*
- b. *flaming combustion*
- c. *explosive combustion*

This was a popular question among candidates. However, lack of detail prevented high marks being achieved, with candidates appearing to rely on their general knowledge rather than revising this topic thoroughly for the examination.

### **Question 4.**

*Compare and contrast the various methods available to investigators for recording a fire scene.*

Many candidates attempted this question. The standard of answers varied greatly: higher marks were achieved by candidates who read the question carefully and paid particular attention to the command words **compare and contrast**.

### **Question 5.**

*You are leading a fire investigation team of a medium-sized fire and rescue service. Discuss how you would manage an investigation at a large protracted incident in relation to:-*

- a. *resources required*
- b. *resource allocation*
- c. *health, safety and welfare issues.*

This was attempted by most candidates, who generally answered it well. High marks were achieved by the candidates who answered the question in a **logical sequence**, enabling all the points to be addressed. Most candidates failed to mention any limitations with regards to resources that may be encountered and how these may be overcome.

### **Question 6.**

*Laboratory analysis of debris from fire scenes for ignitable liquid residue is a valuable tool for investigators.*

- a. *Compare the commonly used methods of sample extraction.*
- b. *Comment on their various advantages and limitations.*

This question was answered by very few candidates. From the answers given it was apparent that candidates who answered it either had a good knowledge of the techniques involved and did well, or had a very sketchy knowledge of them, in which case the answers produced were poor.

**Question 7.**

- a. *Discuss the processes required for the ignition of solid and liquid fuels.*
- b. *Explain the term 'sublimation'.*

This proved to be another popular question with the majority of candidates attempting it. It was one of the better answered questions. Candidates who gained the highest marks included more detailed descriptions of the processes involved and demonstrated a good understanding of the term 'sublimation'.

**Question 8.**

*Describe the processes of a compartment fire from ignition to flashover, indicating the relationship between the fuel package, its location within the room and its effect on the development of the fire.*

This question prompted some of the best answers of the paper. Some answers included in depth details such as the temperatures and levels of heat flux required, which gained them additional marks.

**In general** it was apparent that the standard of preparation for this paper was poor. Many candidates appeared to be relying on their **general knowledge** of the subject, and this resulted in low marks. Answers from candidates who had prepared thoroughly for this paper were easily identified and were awarded high marks. It was evident that not enough time had been allocated by candidates to ensure they had read and fully understood each question. Also, they did not plan their answers effectively. Clear and well labelled diagrams also attracted high marks in some of the questions where this was appropriate.

## Graduateship Examinations.

### Paper 1: Fire Safety.

**Question 1.**

*In residential care premises typical evacuation strategies are likely to involve one or a combination of the following arrangements:-*

- ? *Single phase evacuation.*
- ? *Progressive horizontal evacuation.*
- ? *Delayed evacuation.*

*Describe the strategy for carrying out each of the arrangements listed above.*

On the whole this was a well answered question with a number of candidates achieving high marks. The delayed evacuation strategy answer was confused by some candidates and reduced the opportunity to score well.

**Question 2.**

*Outline the main causes of fires which are due to electrical equipment.*

This question was attempted by the majority of candidates. A list with brief explanations of each cause attracted high marks.

**Question 3.**

*Detail the different classifications of fire in relation to the provision and selection of fire extinguishers.*

This was very well answered by most candidates, with many attracting the maximum marks with short and well laid out answers. However many candidates failed to read the question and went on to waste time and effort by providing extensive explanations that attracted no further marks.

**Question 4.**

*Detail the purpose and requirements of a fire resisting door.*

Candidates had difficulty with this question and missed a good opportunity for high marks with overcomplicated answers. Attention to the bibliography and reading list would have provided a simple one sentence answer for the purpose and then the requirements being: stability, integrity and insulation. The addition of a clear and annotated drawing would then meet the requirements of the question.

**Question 5.**

*Define the following terms in relation to fire safety, using diagrams where appropriate: -*

- a) *Direct Distance.*
- b) *Fail Safe.*
- c) *Final Exit.*
- d) *Means of Escape.*
- e) *Refuge.*

The majority of scripts which attempted this question were not well answered. A paragraph on each would have attracted good marks but on the whole two or three parts were well answered. The other two parts often had essential elements of the answer missing and therefore failed to obtain those all important few extra marks.

**Question 6.**

*Detail the locations and areas in which emergency lighting should be installed.*

Many candidates attempted this question and some very good scripts were provided. It is the case though that a number of candidates had not fully read the bibliography and were not able to provide the full list required.

**Question 7.**

*Comment on the differences in the behaviour of the following types of beam in a fire situation:-*

- a. *Timber.*
- b. *Steel.*
- c. *Reinforced concrete.*

This was a traditional style question that was well answered by many candidates, with many candidates receiving a very high score.

**Question 8.**

*Detail the different types of building boards that may be encountered, and comment upon their characteristics and behaviour in a fire situation.*

This was again a traditional style question that was well answered by many candidates, with many candidates receiving a very high score.

**Question 9.**

*Describe the following: -*

- a. *The function and purpose of a dry riser.*
- b. *The design, positioning and siting of a dry riser.*

This question was attempted by many candidates, however it was disappointing that a 'bread and butter' subject was not well answered by the majority of candidates. Some scripts confused a wet riser with a dry riser and many provided answers framed around codes of practice that did not match the bibliography.

**Question 10.**

*You have been asked for advice by an architect (who is designing a new office building,) concerning access and facilities for use by the Fire Service.*

- a. *List the basic requirements that need to be met.*
- b. *Describe the components of a firefighting shaft*

A few candidates received very good marks for this question but generally section (a) was not well answered. Section (b) was better answered with the use of an annotated sketch assisting with the production of a good answer.

**Paper 2A: Operations.**

**Question 1.**

*Having decided to commit breathing apparatus (BA) crews to a deep seated basement fire, describe the procedures to be put in place before entry is made. Detail the factors covered in the briefing you give.*

Many candidates wasted time detailing stage 1 stage 2 and main control procedures: this gained them the few marks that would have been awarded for a more general statement concerning the need for appropriate breathing apparatus controls and logistical support. Few candidates considered the safety of firefighters or the methods that could be employed to improve conditions: those that did achieved good marks. Several scripts failed to mention factors covered in the briefing to the crew at all.

**Question 2.**

*Explain the essential points that need to be considered by the incident commander when dealing with a severe fire on the upper floors of a high rise block of flats.*

Candidates that achieved good marks covered more than the considerations for extinguishing the fire. They explained the need for salvage, the difficulties of evacuation and the possibilities of fire spread both within the building and to adjacent premises. Whilst some discussed the possibility of using helicopters for evacuation, no candidate considered the fire resistance of the structure and how this might allow residents to remain in their flats.

**Question 3.**

- a. *Explain the use in Fire Brigade operations of natural fibre, synthetic fibre steel wire ropes.*
- b. *Explain how lines, blocks and tackle can be used to mechanical advantage when hauling or lifting objects.*

This was a straightforward question and candidates should have scored high marks, though only a small number did. The majority failed even to address the use of blocks and tackle: those that did drew diagrams of complex pulley systems, whereas a clear simple diagram of the basic constituent parts of a block and tackle would have attracted 25% of the marks available. Several attempts included very complicated arrangements of pulleys that merely changed the direction of pull several times and produced no mechanical advantage. Those candidates who achieved high marks not only understood the correct usage of the various types of fire service ropes, they also understood the principles of mechanical advantage and the cost in terms of velocity ratio to gain that advantage.

#### Question 4.

*With regard to command and control at incidents, explain the function and duties of the following key personnel:-*

- a. *Incident commander.*
- b. *Sector commander.*
- c. *Incident support officer.*
- d. *Operations commander.*

The majority of candidates scored above 10 marks, many just by analysing what they would do at an incident in those roles. In 80% of cases the roles of sector and incident commander were clearly explained: most were less clear about the responsibilities of an incident support officer and few had any idea of what the operations commander did.

#### Question 5.

*Detail and describe the safety devices fitted to a typical turntable ladder.*

Those that attempted this question in the main failed to consider any safety device that did not operate automatically, with the exception of jacking systems. Candidates did not consider the duplication of extension and elevating systems as a safety feature, neither were they aware of the importance of communication from the turret to the head of the ladder in ensuring the safety of personnel.

#### Question 6.

- a. *Describe in detail the classification of fire fighting foams.*
- b. *Which three factors can be varied to influence the behaviour of foam?*

Candidates working in the sphere of operational fire engineering should have achieved a high mark for the answer to this question should be common knowledge. Disappointingly there were few good answers. Many scripts provided **2 or 3 examples of the same class** of foam rather than **different classifications** of foam. Candidates who did this failed to read or understand the question properly. Most failed to understand what could be altered in order to vary the performance of a particular classification of foam.

#### Question 7.

*When attending fires involving metals, explain the hazards to personnel and the techniques that may be used to extinguish the fires.*

Many candidates managed a minimum pass mark in answering this question. Whereas many appreciated that metals involved in fires may react with water, a large number failed to realise that they will react with a **variety** of extinguishing media as well. Worryingly, some thought that foam was a safe option. Many failed to consider the potential of dust explosions from powdered metals. On the positive side most realised that allowing the fire to burn itself out was the best option where it was safe to do so. The correct technique for spreading powdered extinguishing media on to a metal fire was well understood and described.

#### Question 8.

*Explain in detail the contents of a ship's fire plan.*

Several candidates produced good examples of fire action plans explaining in great detail what to do in case of fire: unfortunately the **question did not ask for this**. These candidates failed to realise that a ship's fire plan is a requirement under the Safety of Life at Sea Rules and the content is prescribed by them. Those that achieved high marks not only knew what had to be in the plan, but also knew where copies were required to be kept so that firefighters could find them easily.

#### Question 9.

*Discuss the factors that have to be taken into account when dealing with a leakage of gas at an indoor swimming pool.*

Whilst many candidates made good points concerning the actions necessary to deal with a gas leak and knew that the biggest problem was likely to be chlorine, few explained the hazards or characteristics of chlorine. Those that gave full answers scored well but some candidates seemed to think brief answers that lacked detail were worthy of high marks.

**Question 10.**

*Describe in detail the operational procedure to be followed when attending a fire involving an acetylene cylinder.*

Candidates attempting this question achieved a pass mark by the application of sound operational tactics. The examination markers were aware of varying safe distances applied throughout the world and took a flexible approach. However a **large number of candidates included dangerous practices** in their answers that were likely to result in the death of a firefighter.

**In general**, too many candidates did not read and consider the examination questions carefully enough before writing an answer to the question they thought or wished they had been asked. They failed to appreciate key command words in the questions such as **explain** or **describe**. Often candidates' answers simply listed points of detail. It clearly states on the examination paper that **marks would be given for appropriate diagrams**. Few diagrams were used and fewer still were clear and well drawn.

**Paper 2C: Aero Fire Studies.**

**Question 1.**

*Discuss the operational procedures for dealing with aircraft accidents in water.*

This was a popular question with candidates although many failed to read the question thoroughly. It specifically asks for **operational procedures** and answers should have included using high powered monitors to reach any fire next to the fuselage, access to the crashed aircraft, rescuing casualties downstream and factors such as wind direction tides and currents.

**Question 2.**

- a. *Describe the different ways of producing foam.*
- b. *Explain the following terms associated with foam production:-*
  - i) *Drainage time.*
  - ii) *Induction ratio.*
  - iii) *Expansion ratio.*
  - iv) *Foam solution.*

This was a very popular question with candidates who should have scored high marks quite easily. However, their explanation of the terms (drainage time, expansion ratio, induction ratio and foam solution,) was poor and students gave no evidence that they understood these terms.

**Question 3.**

*Discuss in detail the complementary extinguishing agents for airports in categories 3 – 10.*

This was another popular question and students who provided a table scored highly. Including a discussion on substitution rates would also have scored easy marks. Some candidates neglected to mention airports in category 10, even though the question clearly included them.

**Question 4.**

*Dangerous goods fall into various categories and classes.*

- a. *List the various categories and classes that dangerous goods fall into.*
- b. *Specify how the hazards are communicated to emergency workers.*

Many candidates answered this question and generally they achieved a reasonable standard in their answers. In answering *part b*, candidates could have scored high marks by including information such as the proper names of items, UN numbers, hazard symbols and hazard classification, but many failed to do so.

**Question 5.**

*Discuss in detail the factors in the specification for the selection of airport rescue and fire-fighting appliances.*

Candidates provided answers of varying standards to this question. They should read the question carefully and be clear what they are answering. The question clearly asks for **“specification for the selection of airport rescue and fire-fighting appliances”**, and answers should have included the following:-

- ? Initial outline.
- ? Detailed specification.
- ? Additional specification.

**Question 6.**

*Discuss in detail the different organisations that should be involved in the emergency services co-ordination group (liaison group) and the fundamental areas for the group to consider.*

Many candidates attempted this question, and generally they answered it well. Candidates were required to demonstrate good levels of knowledge and understanding of airport emergency services co-ordination groups or similar bodies.

**Question 7.**

*Outline the features of aircraft construction and describe in detail the features of aircraft power systems and services.*

This was another very popular question with candidates and it produced a varied standard of response from them. Again it was evident that candidates must read the question carefully and answer it directly. Although the features of aircraft construction were covered fully, the second part of the question clearly asks for **aircraft power systems and services** to be **described in detail**. Answers should have included the following:-E

- ? Electrical systems and how they are provided.
- ? APU etc.
- ? Hydraulic systems.
- ? Compressed gases.
- ? Air conditioning.

**Question 8.**

*Explain the hazards that modern turbine engines present to rescue personnel.*

Although many candidates attempted this popular question, it was generally, and surprisingly, poorly answered. Answers should have included detailed sections on the following features: propellers; intakes; exhausts; hot gases; toxic gases and the escape of pressurised fuel.

**Question 9.**

*Detail the special fuels used by military aircraft and explain how the hazard of ejection seats on military aircraft is identified.*

Candidates' answers to this question again revealed that many did not read the question carefully or understand it properly. The question clearly asks for details of **“special fuels”**, but hydrazine and Avpin were rarely mentioned. The identification of ejection seat hazard was very poorly answered: candidates must be aware of these hazards and that they are clearly marked. Answers should have included details such as the inverted red triangle with the words **“danger”** and **“ejection seat”** clearly marked.



**Question 10.**

*Discuss the requirements for rescue equipment for airport categories 3-10.*

This question received satisfactory responses from the candidates who attempted it, although none was awarded a high mark. Students provided lists of rescue equipment and scored marks accordingly, but the question called for a **discussion** of the requirements for equipment for airports across the range of categories, and answers should have concentrated on this. Unfortunately, few candidates focused their remarks or comments in the way the wording of the question required.

**Paper 3: Fire Engineering Science.****Question 1.**

*The resistance  $R$  ohms of a copper winding is measured at various temperatures  $t^{\circ}\text{C}$  and the results are recorded in the following table:-*

$R$ ohms	127.5	129.4	131.7	134.7	136
$t^{\circ}\text{C}$	59	54	59	64	68

*Plot a graph of resistance against temperature and find from it the following:-*

- The temperature when the resistance is 130 ohms.*
- The resistance when the temperature is  $66^{\circ}\text{C}$ .*

This question was attempted by a large number of candidates who were still able to determine the answer to the second part of the question despite the typographical error. In general the graphs were well drawn with reasonable clarity demonstrated in the values of the axis. However some candidates could have used better scaling.

**Question 2.**

- With the aid of an annotated diagram, explain the differences between direct current and alternating current.*
- Describe the effects of electric shocks from each type of current upon the human body.*

This question was only attempted by a small number of candidates and in general the responses were poor. With reference to the diagrams the candidates showed a lack of understanding between direct and alternating current.

**Question 3.**

*Define the following terms:-*

- Flashpoint.*
- Spontaneous ignition temperature.*
- Fire point.*
- Limits of flammability.*

This question was answered well by the large number of candidates who attempted the question and generally high marks were awarded.

**Question 4.**

*A 240 volt generator is supplying three lights in series, of which the resistance is 20,30,60 ohms.*

- Calculate the current flowing.*
- If the lights are placed in parallel, what will be the change in current?*

This question was answered by the majority of candidates very well demonstrating clear working line by line. Some candidates did not show clear working, yet in this type of question it is important that it is shown.

**Question 5.**

*The initial temperature of Ethanol is 22°C. What would be the final temperature of the Ethanol if 3240 joules of energy were used to raise the temperature? (The specific heat capacity of Ethanol is 2240J C kg.)*

This question was attempted by a moderate number of candidates despite there being an omission in the amount of ethanol to be heated. An allowance was made for this and generally high marks were awarded.

**Question 6.**

*Describe the types of energy emitted from a radioactive substance. Your answer should include accounts of:-*

- a. *The effects of this radiation upon the body.*
- b. *The protective measures required to reduce these effects.*

The attempts at this question were generally of a good standard and some particularly good answers were received on the subject of the protective measures required. However some candidates failed to mention time, distance and shielding: had they included these details they would have been awarded higher marks.

**Question 7.**

*Write down the chemical formula for acetylene burning in oxygen.*

- a. *Balance the equation.*
- b. *Briefly describe the hazards of compressed acetylene when involved in a fire.*

This was generally a poorly answered question with very few good scripts presented. The dangers of acetylene are well documented yet a lot of candidates failed to identify the dangerous properties of the gas.

**Question 8.**

*Describe fully the following terms:-*

- a. *Boiling Liquid Vapour Cloud Explosion. (B.L.E.V.C.E.)*
- b. *Unconfined Vapour Cloud Explosion. (U.V.C.E.)*

A large number of candidates attempted this question and generally the responses were very good. However, some candidates confused the two types of explosion while others linked them together.

**Question 9.**

*A cylindrical tank 10 metres in height and 6 metres in diameter is full of water.*

- a. *Calculate the capacity of the tank.*
- b. *The tank supplies (via a pump,) three firefighting nozzles, each of which is 20mm in diameter. Calculate the jet reaction of one of the nozzles if the pressure at the nozzle is 7 bar.*
- c. *Calculate the time taken to empty the tank.*

The majority of candidates who attempted this question produced good quality answers to it. A large number showed clear line by line marking and as a result attracted high marks.

**Question 10.**

*Define the following System International (S.I.) units:-*

- a. *Pressure.*
- b. *Temperature.*
- c. *Energy.*
- d. *Force.*

Generally this question was poorly answered by the majority of candidates who attempted it. In nearly all cases candidates included only the units in their answers and did not give examples or include simple explanations.

#### **Paper 4: Human Resource Management.**

##### **Question 1.**

*Describe a procedure for the reporting, recording and monitoring of accidents to personnel in a large organisation.*

Generally those candidates who were able to draw on their own experience in reporting, recording and monitoring of accidents to personnel within their own organisations gained some marks for their answers to this question. However, in order to achieve high marks, candidates were required **first** to consider a **method of reporting an accident** describing such items as uniformity, information required and the availability of guidance notes. **Secondly**, candidates were asked to **describe the subsequent investigation**, covering such items as contributory negligence, remedial action and supporting statements.

##### **Question 2.**

*Discuss the use of, and necessity for, human resource planning within an organisation.*

This was generally a poorly answered question with few candidates directly responding to the wording of the question, which required that answers be based on **developing a systematic approach** to the recruitment, retention, utilisation, improvement and disposal of an organisation's human resources.

##### **Question 3.**

- a. Define the following terms in relation to fire service managers:-
  - i) Command
  - ii) Leadership
  - iii) Management
- b. Briefly describe how these concepts interlink.

This was a popular question which produced responses of varying quality. Those candidates who had studied the syllabus could easily define the three terms, picking up easy marks. Those who relied on experience found it difficult to separate the three terms and repeated the same points or answered by describing organisation structures, which earned them no marks. Very few candidates could answer *part b* of this question, which required them to describe the several facets of authority invested in an individual.

##### **Question 4.**

*Explain why budgetary controls are important in a public service department.*

This was not a popular question with candidates, and it was not well answered by them. The question required candidates to cover such topics as:-

- ? Budgetary controls enable managers to be accountable for the public funds they expend.
- ? They allow managers to study the performance of the service and compare functions within and outside of the service.
- ? Controls allow estimates to be compared against actual cost.
- ? They enable variations to be analysed and adjustments made.

Most candidates explained in detail **their own organisation's controls** which attracted few marks as the question required them to take an strategic overview as to **why budgetary controls are essential in a public service**.

##### **Question 5.**

*Outline the possible barriers to effective communication between individuals within an organisation.*

This was a popular question with most candidates, who were able to achieve good marks by relying on their own experiences.

**Question 6.**

*Outline the safety and environmental considerations which should receive attention when organising realistic practical fire fighting training.*

This question required candidates to outline both the safety and the environmental considerations. Most candidates answered with regard only to the safety considerations, missing out on marks by not including any environmental issues. Generally, candidates relied on their experience, which produced responses of varying standards. This was disappointing as marks could have been gained easily by describing the control measures that should have been in place, such as limiting the size and time of the burn, briefing personnel in safety procedures and the provision of emergency standby crews. Environmental considerations should have focused on atmospheric and water pollution.

**Question 7.**

*Briefly describe the role of a supervisor in an organisation.*

Most candidates concentrated on describing a specific role within their own organisation. This produced mixed results. The candidates who described a supervisor with the following qualities were rewarded with high marks:-

- ? Having an understanding of, and contributing to, the policy of the organisation.
- ? Having the ability to organise, prioritise and plan work
- ? Having the capacity to communicate with workers and to look after their welfare, training and development needs.

**Question 8.**

*Draw a labelled diagram and explain the key aspects of the Performance Management Cycle.*

This was not a popular question. The candidates who focused firstly on developing, planning and implementing the policy and secondly on measuring and reviewing performance attracted good marks.

**Question 9.**

*Outline and discuss Maslow's theory of motivation in relation to a member of staff who has a personal problem.*

Most candidates who attempted this question obtained good marks for discussing Maslow's theory. Not all candidates then went on to discuss how Maslow's theory could be used in relation to a member of staff with personal problem, for which nearly half the marks available were reserved.

**Question 10.**

*Describe five teaching methods which may be used to facilitate learning in a classroom environment.*

This question allowed candidates to choose from a number of teaching methods used to facilitate learning in a classroom environment. In responding to the question, candidates should have focused on teaching methods such as discussions, project work, role play scenarios, lectures and case studies. Most candidates' answers achieved reasonable marks.

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