Institution of Fire Engineers Education Committee

# 2004 Exam Markers Report

September 2004

*This document contains the report on the 2004 Membership and Graduateship examinations by the Chairman of the Examinations Committee, William C. Cox who has been assisted in this task by Mark Fisher, who compiled the individual examiners' reports*

It is my pleasure as Chair of the Examinations Committee to present the report of the examiners for the Institutions Membership and Graduate Examinations that were held in March 2004.

I hope that the comments of the examiners and the copy of the questions used in the examinations will be helpful to prospective candidates as they prepare for future sessions.

No comments are presented for the Communications papers at either Graduate or Member level or for the Building Construction paper at Member level. So few candidates sat these examinations that any comments would not be a reliable guide for the future. Following discussions and consultations and with a view to the cost of producing the examinations it has also been decided to discontinue with those papers for the foreseeable future.

For economic reasons a "watching brief" will be kept upon three other papers, namely Petrochemical Fire Studies, Marine Fire Studies and Disaster Planning and Emergency Management and depending upon numbers any or all of these may not be offered next year.

It is worth reflecting upon the fact that these examinations are held in many different countries around the world and represent the only method that some members have available to them to show their knowledge. Every effort is made to ensure that the questions set are as international and as fair as possible to all candidates. Not all countries use the same procedures or put the same amount of emphasis on the different techniques yet the principles being applied are the same in each instance. As candidates are completing their scripts and presenting their answers it is the detail contained which shows the similarities and differences, but much more importantly their knowledge and understanding of a situation or technique. That detail is the most important part of the answer and the part that gains the most marks depending upon the level of examination. The higher the level of examination the greater the level of understanding and the greater the depth and detail required.

When reading this report based on comments from the individual examiners you will find the same remark repeated too often, that candidates "failed to give sufficient detail to gain high marks". In simple terms too many candidates are presenting too little information to convince the examiners that they understand the subject, especially at Member level.

It is sad to report that for the second year the Godiva prize for the top student at Member level in the UK was not awarded and for the same reason, no UK student passed all four papers at the one sitting to qualify for Membership.

On a brighter note it is still encouraging to see a number of very good examination scripts being submitted from candidates who feel that this system is one that provides an opportunity to enhance their career prospects.

Finally my thanks must go to the markers, the question setters, IFE staff at HQ, especially David Newman and Kate who are leaving us, and all of those members who freely give their time and energy to make the whole process possible.

**W C Cox MEd BSc CEng MEI FIFireE**
**Chair – Examinations Committee**

# REPORT OF IFE EXAMINATIONS 2004
## Membership Examinations

### PAPER 1 - FIRE ENGINEERING SCIENCE

**Question 1:** *A pump supplies 6 KW of energy to the water flowing through a 45 mm hose. If the water flows 25 metres vertically and through a 25 mm branch at a rate of 480 litres/min, use Bernoulli's equation to find the pressure at the branch.*

There was a wide range of marks awarded for this question. For those candidates who understood the Bernoullis equation the question was straight forward and many scored highly. For those less fortunate who did not understand the equation the advice is the same as previous years, move on and try elsewhere.

**Question 2:** *Combustion has been described as a branching chain reaction involving the production of free radicals. By reference to the mechanism of combustion discuss this statement.*

Candidates should remember that they are sitting a Membership paper and that short quick answers will not attract sufficient marks to pass. What is required is careful consideration of what the question asks for and a detailed response.

On this occasion a good proportion of the candidates clearly did not understand the question, and discussed other aspects of combustion and its inhibition in terms of an extinguishing media. This is a popular question and candidates are well advised to make themselves familiar with this subject.

**Question 3:** *(a) State the units that are used to define radiative heat transfer and provide some approximate values for heat transfer levels typical in fire processes. (b)Give two examples of fire growth processes that are strongly influenced by thermal radiation and describe the mechanism involved. (c) The thermal radiation emitted by a hot body is defined by the product of three parameters, describe the three parameters.*

The highest mark awarded to a candidate for this question was six out of a possible twenty, this clearly demonstrates that the majority of candidates had failed to prepare themselves for this examination. Good marks could easily have been available by the inclusion of the following points:

1. Heat transfer units are KW/M2
2. Ignition process in solid fuels is influenced by the level of applied radiative heat transfer to the surface, higher levels of radiative heat will raise the temperature of the fuels surface more quickly.

**Question 4:** *(a) During a fire 150 m3 of smoke with a temperature of 850°C and density of 0.95 kg/m3 are produced. If this smoke is contained within a ceiling compartment where the ceiling board temperature is 20°C calculate the final temperature achieved. (Dimensions of the ceiling = 6m x 6m) Assume the temperature of the ceiling is constant to a depth of 3 mm) (Specific Heat Capacity of smoke = 1.1 kJ/kg°C) (Density of ceiling board = 250 kg/m3) (Specific Heat Capacity of ceiling board = 1200 J/kg°C) (b) Outline three assumptions made in completing the calculation*

An unpopular question which had the majority of candidates scratching around for the odd mark. Not good enough at Membership level, candidates must be familiar with this type of subject and comfortable working with formulas and calculation. Some candidates did take advantage of picking up the nine marks available in the second part of the question by correctly listing three of the six possible assumptions.

**Question 5:** *Discuss how the structure of the building influences the growth of a fire.*

Approximately 75% of candidates scored very poorly on this question by focusing on the construction of the building rather than what was being asked for, the influence of the structure. Candidates must read the question and understand what is being asked of them prior to answering.

**Question 6:** *Describe the method of operation and construction of devices, which can detect heat.*

Having read some of the previous questions, candidates must have viewed this question as a gift and when you take into account the number of attempts and subsequent moderate-high score rate achieved, it is obvious that the majority of candidates understood the subject. Good submitted scripts contained accurate diagrams of the various detection devices, well laid out descriptions and evidence of a structured approach.

**Question 7:** *Discuss the properties, uses, hazards and storage precautions associated with nitric oxide.*

Only 2% of candidates achieved a pass mark for this question, the resultant majority either misread the question and described Nitric Acid, or knew very little about Nitric Oxide. It is clearly obvious that candidates should familiarise themselves with this chemical as part of their post examination revision programme. The answer to this question can be found in the Hazardous materials fact sheets printed in the Journal.

**Question 8:** *Discuss the use and effectiveness of the protective measures used in electrical circuits to safeguard individuals and equipment.*

It is surprising that candidates failed to achieve higher marks with this question although it is certain that they would have been asked this information previously throughout their careers. The model answer points to the following protective measures and asks for some discussion as to the effectiveness of each:

1) Earth Connections
    a) Water pipe
    b) Rod or Plate
    c) Cable Sheath
    d) Protective Multiple Earthing (PME)
2) Shock Protection
    a) Fuse
    b) Residual Current Device

## PAPER 2 - FIRE SAFETY

**Question 1:** *Natural disasters occur through out the world, especially with climatic changes. Outline those fire safety measures that should be borne in mind to help protect the potential threat of fire during or immediately after a tornado, hurricane or cyclone?*

This was not a popular question, with the majority of candidates focusing their answers away from what was being asked for in the question. If candidates considered the statement 'protect the potential threat of fire during or immediately after' and structured their answer to include issues such as chemical safety, electrical safety, gas safety, then easy marks would have been achieved. There were quite a few scripts with answers explaining how these natural phenomenon are created but this approach achieved no marks and wasted valuable examination time.

**Question 2:** *As a fire safety manager you are tasked to write an 'information sheet' on the fire behaviour of insulating core panels (sandwich panels) used for internal structures of buildings. Draft such an 'information sheet' outlining the key areas and detail the design stage strategies that can be used.*

The depth of knowledge regarding 'sandwich panels' demonstrated by the candidates who attempted this question was insufficient to achieve a pass mark. This situation is very disappointing, because there has in recent years been so many articles written on the subject which remains very relevant in today's industrial environment. It is, therefore, recommended that candidates review the bibliography associated with this subject which can be found within Appendix F of the approved Document B, pages 130-131.

**Question 3:** *Planning recovery from a major fire in a school should form part of any initial fire safety advice given, i.e. disaster recovery. Discuss this recovery and outline those key areas that should be considered.*

The key information that would have led candidates down the correct line of answer, rather than concentrating on matters such as fire precautions, training and the need for fire drills, (which attracted few marks) was 'planning a recovery from a major fire'. This clearly refers to tasks/issues that would need to be addressed 'post' incident and would naturally include such things as security of premises, salvage and safety checks on the premises services. Candidates, therefore, must read the question and understand what information is required before making an attempt.

**Question 4:** *Discuss (a) The general "principals of risk prevention". (b ) The term "fire engineering".*

A very good question to gain easy marks and many did. For the few, however, it was a different story. They either misread the question or had little knowledge regarding this subject and submitted answers focusing on the many issues relating to 'fire prevention' and not 'risk prevention'. The bibliography associated with this subject is contained within Schedule 1 of the Management of Health and Safety Regulations 1999 and through definition from the IFE website.

**Question 5:** *When considering the convective heat transfer mechanism, briefly describe the main factors that influence the operation of a sprinkler head*

Generally candidates displayed a sound knowledge of this subject and achieved good marks. The one part of the answer that all too commonly was omitted was the reference to the shape and thermal properties of the ceiling. This type of question will appear in many forms and it is well worth candidates making the time to be fully conversant with this concept.

**Question 6:** *Healthcare staff in hospitals need to learn about, and practice, basic fire actions, including special needs training for particular locations. Discuss in detail those actions.*

On this occasion, when considering the number of attempts at this question and the quality of answers received, it was obvious that the majority of candidates were well read on this subject. I shall, therefore, only give some of the areas that were commonly omitted from answers. These were, the function of fire doors, procedure for contractors, special training for ICU Staff, and services and oxygen. With a more logical approach to the presentation of the answer some of these points may not have been missed.

**Question 7:***Portal frame constructed buildings are used throughout the world for a variety of industries. By use of simple annotated sketches, identify the behaviour of portal frames in fire and relate to the sequence of collapse.*

Only one candidate achieved near perfect marks for this question that referred to a constructional method that has been with us for many years.

The clues for the answer were, however, in the question 'simple annotated sketches', 'behaviour in fire' and 'sequence of collapse'. So many failed to read the question and attempted to answer with the omission of well executed diagrams.

**Question 8:** *Means of escape objective is to ensure that there are adequate routes, which are suitably protected, lit and signed, for people to escape from all parts of a building. Detail the design considerations for that objective.*

The last question in this years paper and probably the most attempted. Candidates generally, as expected, demonstrated a good understanding regarding the principles of Means of Escape, but there were a few less fortunate souls who again failed to understand the question and whose answers deviated away from what was being asked for. For those candidates I suggest you read the 'Design Principles of Fire Safety' HMSO 1996 Pages 107 and 108.

## PAPER 5 - HUMAN RESOURCE MANAGEMENT

**Question 1:** *Describe the key constituent elements of an Equal Opportunities Lack of Conduct Policy*

This proved an unpopular question with the majority of candidates failing to hit the key points. This was indeed very surprising considering the amount of promulgated information regarding Equal Opportunities.

Marks would have been gained if candidates had identified the four key areas of:

1) Code of Conduct Policy and Recruitment
2) Interview
3) Training, and
4) Promotion

Clearly candidates struggled to identify, and expand upon, these elements.

**Question 2:** *Describe how you would counsel a solution to settle grievances and to arrive at an equitable solution.*

An "old chestnut", but this year looking for a solution and not a process. I mention this here as this is where many candidates lost marks, they were not necessarily looking for a way of

achieving an acceptable solution, rather what procedure should be adopted for interviews and subsequent action. The model answer was looking for the key areas of listening, defining the problem, staying alert and flexible, observation and concluding the meeting.

**Question 3:** *Describe the key elements in the development and implementation of a Computerised Personnel Information System.*

The key to achieving a high score with this question was to approach the answer with a strategic viewpoint and systematic approach. Too many candidates failed to achieve this and concentrated on specific issues ie which type of data should be held etc. Some of the key points that if mentioned would have scored well are overviews like, determine objectives, carry out a feasibility study, plan an implementation programme etc. Candidates must be aware that at Membership level we are looking for strategic responses to questions and must study accordingly.

**Question 4:** *"An effective leader finds the right balance between concern for people and his/her responsibilities to the organisation". Discuss this Statement.*

It is reassuring that the majority of candidates understand the principles of leadership and submitted excellent scripts, many quoted such guru's as John Adair and Maslow. Good marks were awarded for those candidates who struck a balance between weighing up options prior to making decisions and who were also aware of what was important to their staff.

**Question 5:** *Describe how leadership skills can be used to introduce changes within an organisation.*

Overall the question was answered well. Candidates were well read and fully conversant with the principles of change management.

Marks were awarded for discussing the difficulties of introducing change and for highlighting good practices in order to ensure a smooth transition. Throughout the world this process appears to be understood which bodes well for the future of fire engineering.

**Question 6:** *Explain the concept of continuing professional development and its importance to you as a professional.*

The question was in two parts, each part had ten available marks. Unfortunately, although the majority of candidates were fairly well conversant with the principles of CPD they were not equally as sharp regarding its importance to the individual and consequently easy marks were all too commonly lost.

It was disappointing bearing in mind the amount of articles in the IFE Journal and other technical publications regarding CPD that so few candidates achieved high scores.

**Question 7:** *Explain why the use of job description and employee/person specifications are important in the recruitment and selection of staff.*

Although this was a popular question it was generally not understood that it naturally fell into two parts. If candidates from the outset had realised this and concentrated their efforts to producing two explanations, one regarding job descriptions and one for personnel specifications, then with the added advantage of a methodical approach more marks could have been achieved by the masses.

Candidates must look for different ways of interpreting questions requirements to achieve higher marks.

**Question 8:** *Control as applied to business is the direction of activities to achieve an objective. Explain the various factors that have to be taken into account in developing a control plan.*

This was not a particularly popular question, although those candidates that did attempt it, scored very well. Candidates were familiar with the planning process and understood how to control, monitor and review.

Good marks were equally awarded to candidates who could further offer suggestions regarding the planning process and describe how that could be effectively controlled. Marks were picked up by candidates who understood the principles of control measures including such issues as:

1) Clear plans
2) Objectives
3) Standards etc.

However, with the majority of available candidates failing to attempt this question it must be assumed that there is a gap in the knowledge of most perspective candidates

regarding this subject. It cannot, therefore, be over emphasised how important it is that this subject is included in any study programme undertaken at Membership level.

## PAPER 6 - FIRE SERVICE OPERATIONS

**Question 1:** *Discuss the concept of dynamic risk assessment in relation to Fire Service Operations.*

This was a popular question with candidates generally understanding what was required and having the knowledge to demonstrate a good degree of confidence when discussing this subject. Candidates had a good understanding of the CACFOA and Home Office documents that formed the basis of the bibliography associated with this type of question.

**Question 2:** *Discuss the use of specialist equipment over conventional Fire Service equipment at incidents involving large storage tanks.*

The model answer for this question naturally fell into three parts. Firstly, the limitations of conventional fire service equipment. Secondly, points were available for consideration of other options such as, use of fixed equipment and use of elevated equipment and, lastly, there was a list of the implications of using specialist equipment. Candidates scored well in the first two parts but lost marks by not mentioning points such as savings in foam equipment and reduced number of firefighters directly involved in firefighting.

**Question 3:** *(a) Briefly describe the general arrangements for the storage of chemicals on bulk chemical carriers. (b) Outline the relevant operational considerations when dealing with a fire involving a bulk chemical carrier whilst in port.*

This was not a popular question but those candidates who attempted this question submitted reasonable scripts that achieved good scores. The question was in two halves, candidates tended to favour the requirements of the first part but lost valuable marks by either misreading the question or not having sufficient knowledge of the issues required in the second part. The two areas that candidates commonly omitted were those of:

1) Assessing the number of rescues to be carried out and
2) Consideration of the potential for the development of a toxic environment

**Question 4:** *When dealing with fires in high rise buildings and malls, fire officers need to be aware of the 'Stack Effect'. (a) Describe in detail the 'Stack Effect'. (b) Discuss available options for ventilation when determining firefighting tactics*

This is a common subject and one that that keeps occurring throughout fire engineering examinations. It is therefore surprising that at this level there were scripts submitted lacking in details and with candidates omitting to mention some of the basic facts relating to the phenomenon. One such point was failing to realise that a smoke layer can develop as the hot gases rise and mix with the cooler air, if the conditions are right this cool air will cease to rise.

Candidates must, therefore, revisit this subject prior to attempting this type of question in the future. The bibliography associated with this question is the Home Office Fire Service Manual Volume 2 Fire Service Operations Compartmental Fires and Tactical Ventilation.

**Question 5:** *Discuss how operational procedures and the effective use of technology can assist in managing the reduction of malicious false alarms.*

The majority of candidates that attempted this question submitted excellent scripts. Equal marks were available for discussion focused around operational procedures and the use of technology. It was the latter of these however where candidates dropped the most marks. Marks were available for those who understood the principles of automatic call tracing, calling line identification and the use of geographical information systems, that would provide management information of malicious false alarms.

**Question 6***: Discuss the major considerations when determining operational procedures at an incident involving radioactive materials*

For the candidates that attempted this question there were easy marks to be had. Incidents involving radiation are not new and professionals approaching Membership level should have a good grasp of issues associated with radiation. It was, therefore, disappointing that so many highlighted the major points but within their discussion failed to bring out some of the finer points. I can only suggest that

candidates properly prepare for this type of question and remember the issues around it namely, the implementation of PPE, consideration of environmental pollution and the implementation of the appropriate decontamination arrangements.

**Question 7:** *Detail the reasons for ensuring effective post-accident discipline at aircraft incidents away from airports, illustrating your answer by reference to some of the factors which must be taken into consideration*

It was surprising that this was not a popular question in this years examination. If candidates had imported their own general knowledge regarding air crashes marks would have easily been achieved. Effective post accident discipline at aircraft incidents is essential because, taking into account any large aircraft incident in more recent years, the wreckage may be widely spread over a wide area. There is a need to take into account scene safety and with a view to future police activity there is a need to preserve evidence.

**Question 8***: Produce an outline specification for an Information Technology-based system for the management of Fire Service equipment.*

An interesting question with a great deal of relevance to many fire engineering authorities. It was not, however, a popular question but the candidates who did attempt it did have sufficient in-depth knowledge of this subject to achieve a pass mark. For everybody else, you are recommended to revisit the bibliography associated with this question.

## PAPER 7 - AERO FIRE STUDIES

**Question 1:** *(a) The level and scale of rescue and fire-fighting protection to be provided at any aerodrome is determined by what factors. (b) Explain what is meant by the terms (i) "Temporary Reduction" (ii) "Response Time"*

This was a very popular question and it was obvious that the majority of candidates held sufficient knowledge to obtain a pass. The area where marks were lost generally focused on candidates failing to understand the terms:

1) Temporary reduction, and
2) Response time

**Question 2:** *(a) List the factors to be considered for the provision of fire stations at aerodromes. (b) What are the general features of an Airport Fire Station? (c) Describe in detail the requirements of appliance/vehicle housing rooms/appliance bays*

A very popular question with the majority of candidates achieving an easy pass mark. It was pleasing to see that not only had candidates applied themselves in preparation for this type of question, they had also read the question and understood it before putting pen to paper.

**Question 3:** *(a) Define the term "Dangerous Goods" (b) List the different classes of Dangerous Goods (c) The segregation of dangerous goods is extremely important when being transported by air. Which dangerous goods can and cannot be stowed next to one another on an aircraft.*

Candidates enjoyed the simplicity of the first two parts to this question but then lost valuable marks by failing to complete the required table for part three.

The definition of a 'dangerous good' is 'any article or substance which is capable of posing a significant risk to the health and safety or property when carried by air'. This definition attracted two marks and each of the nine classes were worth one mark each.

**Question 4:** *(a) What are the heliport categories, including the helicopters overall length (b) What is the minimum amounts of extinguishing agent to be provided for surface level heliports for each category (c) What is the Response time for "Elevated Heliports"*

This was an unpopular question, but the paradox is that the majority of candidates who attempted it achieved almost perfect scores. Therefore, a lot of work had been undertaken by the few. The model answer for this question can be found within the following publication 'Airports and Aircraft Fire Protection, Firefighting and Rescue Techniques' R W Docherty, IFE second edition 1999.

**Question 5:** *(a) List the people involved in the formation of an airport emergency planning committee. (b) What is the purpose of this committee? (c) What are the types of emergency that the emergency plans would cover?*

This was a popular choice of question and candidates generally demonstrated a good knowledge of the subject. If marks were lost it was generally within Part (a) of the question

although there were 15 marks available, many were lost with candidates failing to come to terms with who sits where within the two categories of Internal and External Agencies.

**Question 6:** *What are the factors to be considered when detailing a specification for a rescue and fire-fighting vehicle?*

This question appears time after time in this format so candidates had no excuse not to appreciate the three phases of specification of this type of appliance. The three phases are:

1) Preliminary considerations
2) Preparation of specifications
3) Additional contractual considerations

Each of which is adequately explained within the associated bibliography to this question and candidates who did mix up these phases are recommended to adequately prepare themselves for future attempts at this type of question.

**Question 7:** *(a) Name the different types of difficult terrain for which specialist facilities may be required. (b) List the types of specialist vehicles/facilities required for rescue operations within difficult terrain/areas (c) List the basic equipment required for rescue operations within difficult terrain/areas.*

This question proved to be unpopular with candidates and indeed many of the attempts failed to achieve a pass mark.

The question was clearly in three parts and with the adoption of a logical approach each section would have logically followed the other. There were actually marks available for information that fell outside of the acceptable parameters.

As too often, candidates failed to mention in Part A some of the following points which, once omitted, had a knock on effect for Parts B and C.

1) Sea or large bodies of water
2) Swamps, estuaries or tidal rivers
3) Mountainous regions/areas
4) Desert areas
5) Locations which are subjected to seasonal snowfalls

**Question 8:** *Discuss the potential for the use of tin-based flame resistant treatment to be used in aircraft cabin furniture.*

Paradoxically this question had the shortest model answer, the fewest attempts and the lowest pass rate of this paper. Clearly tin based flames resistant treatment was not high on peoples' agendas for revision, a stance that I hope will be reversed in subsequent years. Candidates attempting the Institution's examinations must not only familiarise themselves with the examination bibliography but, in addition, should regularly read the articles in the IFE Journal.

## PAPER 8 - FIRE INVESTIGATION

**Question 1:** *(a) Describe the structural hazards at scenes of fires and explosions. and (b) Explain what you understand by the "500-degree Celsius rule" to mean*

The majority of candidates answered this question well and achieved very good marks. Others, however, were unfortunately guessing at the answers and achieved little. Candidates must remember that at Membership level the only clear course to success is that of sound preparation.

**Question 2:** *The guide to fire and arson investigation refers to the contribution of 'first-response' teams. List and briefly describe the observations that fire fighters might make during the fire.*

The majority of candidates demonstrated their knowledge regarding this subject by the submission of excellent scripts and were awarded comparable marks.

Usually candidates who applied a common sense approach and used their practical knowledge achieved a pass mark, whereas those who followed the questions instructions of listing and describing faired better and scored higher. Whether it was the lack of knowledge or failing to read the question properly that lost candidates marks is now immaterial but it illustrates that candidates need to be better prepared for this type of question.

**Question 3:** *Concerning a fatal fire the coroner/procurator fiscal will require answers to a number of questions. Provide six example questions and indicate how scene investigators can provide the answers.*

Only two candidates demonstrated sufficient knowledge to achieve almost full marks which

considering the contents of the question, was disappointing. The majority of submitted scripts were of a low standard with candidates drifting away from what was being asked for, or demonstrating a lack of knowledge of this subject. This is a common question and prospective candidates must be well versed in this subject.

**Question 4:** *(a) Explain the influence of (i) ceiling height on the formation of a hot smoke layer in a growing fire and (ii) the fire position with respect to walls and corners. (b) State why these effects will influence the possibility of flashover.*

It was pleasing to see all candidates follow the structure of the question and approach answers in a methodical manner.
This however did not help the candidates who were not adequately versed in this subject and who unfortunately lost marks by omitting information such as, the entrainment of cold air is greater in rooms that have higher ceilings, therefore the smoke temperatures experienced will be reduced and that the temperatures against a wall or corner could be reduced by 50-75% respectively.

A general omission was made by all candidates regarding the temperature range in which a flashover may occur and its relationship with the ceiling height and position of the fire.

**Question 5:***(a) Explain the benefits of evaluating and measuring depth of timber char. (b) List the factors and key variables that affect the validity of depth of char pattern analysis. (c) List the variables that effect the rate of charring of wood.*

Considering wood charring has scientifically been considered as a method since the fire investigation science began, this type of question has and will remain relevant and popular throughout that time. Candidates, therefore, omit this question from their revision programme at their peril. This year candidates presented their answers in such a way as to confirm that they had not familiarised themselves with this method and the majority failed to secure a pass mark.

**Question 6:** *(a) Describe (i) six variables that affect the condition of glass in a fire. (ii) two factors which can affect the degree of smoke staining on glass. (b) The presence of thick oily soot on glass, including hydrocarbon residues, has been interpreted as positive proof of the presence or use of a liquid accelerant. Discuss.*

All candidates demonstrated they had a general knowledge of this subject but at Membership level a more in depth explanation was required and, therefore, few achieved high marks.

The six variables included such points as, the type and thickness of the glass, the degree of insulation to the edges provided by the glazing method and the role of locking. The degree of smoke staining is directly dependent upon the distance from the heat source and available ventilation.

**Question 7:** *(a) Describe the purpose of fire-scene reconstruction and the way in which it assists the investigator (b) Describe how debris should be removed during a fire investigation? (c) How may the pre-fire position of contents, or remains of contents, uncovered during debris removal, be determined? and (d) What are the dangers of guessing their likely pre-fire positions?*

A very popular question with candidates achieving a full range of scores. Some candidates strayed away from the question and focused on very specific features. Other candidates were very general with their comments which lost them marks. Candidates must read and understand the question, think about their answer and structure their answers in accordance with what is being asked of them.

**Question 8:** *Describe (a) the common components of 'Traditional' upholstered furniture. (b) where and how smouldering is most commonly induced in such furnishings. (c) the minimum time frame of smouldering before flaming evolves in such circumstances (d) the damage pattern the investigator would expect to find following such a period of smouldering.*

Clearly from the scoring table candidates either did or did not understand the question. For those that only achieved low marks there appeared to be a lack of knowledge as to what was considered to be traditional construction.

Polyurethane foam was thought of by some as being traditional whereas answers including materials such as feathers, wood, cotton etc scored well.

Part(C) of the question generated some interesting answers, the correct answer was that the minimum time for flaming to develop from smouldering is in the order of one and a half hours.

## PAPER 9 - MARINE FIRE STUDIES

**Question 1***: Describe the five elements of construction used in ship design*

Generally those candidates that attempted this question understood the concepts of ship construction.

The majority remembered the essential features of construction but failed to take the opportunity to elaborate on these points, therefore, failing to achieve higher marks. Candidates, therefore, are advised to take the time to improve their chances of passing by showing the markers and setters that you understand the subject.

**Question 2:** *Discuss the issues affecting command when firefighting on vessels both at sea and in port.*

Those candidates who could identify that the command of marine incidents was a three way split between the ships master, the fire officer and harbour master, and who could demonstrate with further detail their knowledge of this subject, scored well and all credit to them. For others, however, this subject posed a problem with candidates attempting to answer on a subject that they were ill prepared for.

**Question 3:** *Outline the SOLAS provisions for means of escape from accommodation, machinery and cargo spaces.*

This question was quite specific in its requirements. It looked for knowledge regarding the features that have been incorporated into a ships design to provide means of escape, therefore as with buildings, the general principles of, method of protection, number of routes, travel distances, restrictions, fire exits, should have been considered and explained.

This question required specific knowledge of the subject which could only be obtained through studying the subject. Dependence on experience alone on this subject would have, and did, provide insufficient details at Member level to achieve a satisfactory pass mark.

**Question 4:** *(a) Define the term 'metacentric height' (b) Show with the aid of diagrams how the metacentric height affects the equilibrium of a ship*

This was a two part question requiring a definition (precise statement) of the term Metacentric height. This could have been shortened to one sentence if the candidate was conversant with this subject.

Part B was a bit more involved, however. Three diagrams that referred to how the Metacentric height effects stable, unstable and metastable conditions, would have been sufficient to have achieved an excellent score. Other marks would have then been available for explanations on the conditions 'STIFF' and 'LOLL'.

Better preparation is, therefore, required on the subject.

**Question 5:** *Discuss the use of onboard firefighting systems to contain fires on ships.*

This question was answered reasonably well by the majority of candidates. It offered the opportunity to apply experience to specific knowledge.

Although most candidates were aware of what types of systems were available on board ships, they did not pay any credence to the 'discuss' at the beginning of the question. If they did it would have prompted them to present the advantages and disadvantages of each, which would have attracted adequate marks to have achieved a pass.

**Question 6:** *Discuss how the injection or removal of water from ship's tanks or compartments can be effective methods to maintain stability when dealing with a fire on board ships.*

This was a popular question and most candidates demonstrated an understanding of the subject, yet no-one was able to achieve more than half the available marks. Most candidates had sufficient knowledge to mention 'free surface' water removal methods and counter flooding but failed to develop their discussions to include the detail that would have attracted higher marks.

**Question 7:** *Discuss the actions that need to be considered by the first officer in attendance at a ship incident*

Answers should have included the factors the First Officer in attendance should consider, the type of information required, how this is used to formulate a plan and how this is implemented in the early stages.

Candidates who could grasp this logical approach and who had adequately prepared themselves for this all too common line of questioning generally scored very well and achieved a comfortable pass mark.

**Question 8:** *(a) What is the IMDG Code? (b) Describe its format, and outline the content of the code.*

It was sufficient purely to state that (IMDG) stood for the International Maritime Dangerous Goods code.A brief description of the code was required to achieve all the marks available in the first part of the question.

The second part of the question, however, was where most of the marks available were lost and throughout marking the various submitted scripts it did become all too obvious that candidates, although not holding sufficient knowledge of the subject to score well, saw this question as a last ditch attempt to achieve some marks for the papers overall score.

This is a very important subject within shipping and must be taken seriously within any examination preparation covering this subject.

## PAPER 10 - PETROCHEMICAL FIRE STUDIES

**Question 1:** *(a) Describe methods of measuring flash points of a liquid in closed and open cup apparatus. Give the names of the apparatus you describe. (b) Explain why the flash point measured will often be different between closed and open type apparatus (c) Explain how the rules on international transport define a flammable liquid.*

Only one candidate attempted this question. It is, therefore, quite obvious that the remaining candidates who sat this paper had not adequately prepared themselves for this type of question. Candidates must make themselves conversant with the bibliography associated with any examination that they may wish to attempt otherwise the chances of securing a pass mark are reduced.

**Question 2:** *(a) Give three examples of gases used to produce an inert atmosphere inside a storage tank of process equipment. Give reasons why each may be the best option in different circumstances. (b) Describe an application in which inert gas is used to make a process or stage facility safe*

In the main this question was well answered. There was a lack of detail given for these gases which included:

1) Nitrogen
2) Carbon Dioxide
3) Exhaust gas

Many students did, however, correctly identify ARGON as another gas that, if used, would form an inert atmosphere but failed to mention how rarely it is used for this purpose.

**Question 3:** *High risk activities on petroleum plant are often controlled by permits to work. (a) Give three examples of maintenance work that might need to be controlled in this way. (b) What checks should be made by the person issuing the permit? (c) What details should be included on the permit? (d) What procedures should be followed when the work is complete?*

This question was generally well answered with candidates approaching the answer in a methodical manner, producing lists based on acquired knowledge and a degree of common sense. The adoption of this approach generally achieved a good pass mark.

**Question 4:** *(a) Describe the main features of a fixed foam pourer system for fire protection of a storage tank, and the main features of a subsurface injection system. (b) What types of products are stored in tanks protected by these systems? (c) What types of foam compound are used in such systems? (d) What are the advantages and disadvantages of such systems?*

Generally a well answered question, well executed diagrams accompanied by sufficient explanation, scored well.

Some of the areas that were commonly omitted were points such as, pourer systems generally have three or more pourers and that these systems are not designed to be effective on heavy oil liquids. However, despite these minor points and in-depth knowledge of this subject was held by the majority who attempted this question.

**Question 5:** *Describe a major fire or explosion incident which involved liquefied petroleum gas. What was the immediate cause of the incident, and what factors allowed it to develop out of control? Indicate any failings in the plant design, maintenance and the way it was operated.*

As well as the 1966 Feyzin Accident and the more recent 1984 Mexico City incident, which formed the basis of the model answers, candidates had the opportunity to base their answer on their operational knowledge, which if kept to the parameters of the question could have achieved sufficient marks to have passed the question.

**Question 6:** *(a) Outline the stages in the manufacture of either polystyrene or polyvinyl chloride from simple petrochemicals . Indicate the hazardous properties of the raw materials and intermediates used. (b) Give examples of consumer products made from polystyrene and polyvinyl chloride (c) What sources of information would you use to find out about any dust explosion risks associated with these polymers?*

Only two candidates attempted this question and I think it is appropriate to reproduce the model answer for the question here for future review prior to attempting this type of question again.

'The usual route to manufacture of polystyrene is as follows
Benzene plus ethylene reacted together to make ethyl benzene
Ethyl benzene is dehydrogenated to form styrene (vinyl benzene). These two steps may be combined in the same process plant. Hydrogen is formed in this stage
Styrene is polymerised usually with water present to control the heat released, and using a special catalyst (initiator) to start the process that forms polysyrene.
There are two main routes to make vinyl chloride from ethylene. Direct chlorination produces a crude stream of thylene dichloride, which can be purified by distillation. Ethylene dichloride is then cracked at high temperatures to produce vinyl chloride and hydrogen chloride. In the oxychlorination process ethylene reacts with hydrogen chloride and oxygen to produce ethylene dichloride, which is again purified and passed forward to the next stage. Vinyl chloride is polymerised in various processes, often using water as a means of controlling the heat released, and a catalyst (initiator).
Benzene is a flammable liquid
Ethyl benzene is a flammable liquid
Hydrogen is a flammable gas, that is lighter than air and very easily ignited
Styrene is a flammable liquid
Styrene may also polymerise if heated
Ethylene is a flammable gas
Chlorine does not burn but is extremely toxic and choking
Hydrogen chloride is a toxic gas producing choking fumes
See data sheets on styrene, vinyl chloride and ethylene dichloride
Polystyrene is used in a foaming form to make packaging, plastic cups, cutlery etc and in sheet form to make cheap clear plastic products
Polyvinyl chloride is used in rigid form to make guttering, pipes, and many other products. In a flexible form it is used to make groundsheets, insulation on electric cables, kitchen floor covering
Manufacturers safety data sheets are the most obvious source of safety information. If these are not available, a search of the intranet produces answers quite quickly. The most complete set of test data on dusts for explosion hazards comes from
http://www.hvbg.de/e/bia/fac/stoffdb/index.ht
ml but this is not all in English. This was quickly found on Google

**Question 7:** *(a) What can be done to limit the risk of fires started by lightning strikes on process plant? (b) Explain what is meant by pressurised electrical equipment, and how this can prevent electrical equipment from causing an ignition source for gases or vapours*

As with this question it must be unfortunately obvious, by the omission of simple points, that candidates did not at Membership level hold sufficient knowledge of this subject to achieve a pass. Points such as:

1) Bonding of metal parts
2) Tanks containing liquids with a flashpoint below room temperature will require arresters, and
3) The requirement to preserve the seal around floating roofs to prevent vapour leakage,

Should have been produced repeatedly as issues associated with this subject.

**Question 8:** *The normal rules for means of escape may not be applicable to open air plant in petrochemical plants. What factors would you consider when the plant designer asks for*

*your advice about safe means of escape from all places people need to work in a tank farm, on a jetty handling bulk transfers from ship to shore, and in a noisy compressor house?*

The question was clearly in three parts and deserved to be approached in that vein. If more candidates thought logically through each of the three sections and structured their answers accordingly, the high marks may have been available to the masses. Unfortunately, however, answers were not precise and wandered through each section with no direction. Marks were not awarded to candidates who completely misread the question and produced excellent scripts detailing the firefighting techniques at fixed installations, it was not what was being asked for and, therefore, no marks were awarded.

## PAPER 11 - DISASTER PLANNING AND EMERGENCY MANAGEMENT

**Question 1:** *Detail the common objectives in the pre-planning phase for a major disaster.*

This question was quite specific with its requirements and generally candidates produced a priority based list of the common objectives. Some candidates did drop some marks by deviating away from the approach, focusing in- depth on a few issues rather than appreciating the strategic goals.

**Question 2:** *Give an overview of the considerations to be made in the Pro-active and Re-active phases of disaster management.*

It was surprising that with a question like this that offered the candidate the opportunity to obtain excellent marks, so few actually attempted it. Those that did were obviously well read on the subject and produced excellent answers focusing on issues such as planning, legal matters and organisational roles and voluntary support within the pro-active phase and media and communications within the reactive phase of disaster management.

**Question 3:** *Experience of major incidents has highlighted the need to plan for the involvement of Elected Members (local politicians) in support of the role of local authorities and the emergency services. Describe their role "during the emergency"*

As expected this was a popular question which for some offered the opportunity to include in their answers issues such as dealing with constituents expressing grief, welcoming visitors, dealing with the media, which they may have had witnessed at incidents they had attended. Where marks were lost was by candidates who confused the role of elected members with that of operational managers, and whose answers extended beyond 'During the Emergency', which was what was being asked for.

**Question 4:** *Describe the importance of risk assessment in managing major civil emergencies*

Despite the recent high profile associated with risk assessment it was all too commonly the case that candidates failed to include in their answers sufficient detail to achieve high marks. Candidates are, therefore, required to study this area further and understand the basics of risk assessments, their legal foundations and practical application.

**Question 5:** *Describe the different categories of volunteers likely to become involved in disaster response , and highlight how "casual" volunteers can be best used at a disaster site*

Candidates demonstrated not only a good understanding of the different categories of volunteers but also that they had read and understood the questions, excellent scripts were received with high marks awarded. The four broad categories of volunteers are:

1) Established organisations
2) Those with specialist skills
3) Casual volunteers
4) Organisations providing emotional support

Additional marks were awarded to those candidates who could describe the roles and limitations of each group, and how to best integrate the volunteers in an organised fashion.

**Question 6:** *Describe the role of the Police Casualty Bureau at a major incident and the considerations to be made in setting one up*

The role of the Police Casualty Bureau is a subject matter that appears all too frequently in this paper and it was, therefore, disappointing to see so many candidates failing to understand and demonstrate adequate knowledge of this subject through their submitted scripts. Candidates must, therefore, include this subject in their post examination revision.

**Question 7:** *Discuss the problems associated with the visual identification of bodies following a disaster and how "misidentifications" can occur*

If candidates had read and understood the question their answers may not have led them down the path of submitting answers that primarily focused on the 'Methods of Identification'. Some candidates, therefore, did lose marks, their answers should have concentrated on issues such as body composition – were they intact, pressure to release bodies and that misidentification can occur, due to bodies being wrongly identified.

**Question 8:** *Briefly discuss the nature of Post Traumatic Stress Disorder (PTSD) in the context of exposure to major disasters and explain how a traumatic event may be re-experienced by an individual suffering from the effects*

This was not a popular question but those candidates who did attempt it generally provided well executed answers. Marks were awarded to those who included a description of events 'outside the range of usual human experience' and that PTSD requires clinical diagnosis and not everybody will be affected. Individuals could experience flashbacks and recurring dreams.

# Graduateship Examinations

## PAPER 1 - FIRE SAFETY

**Question 1:** *Detail a) The components of a typical gaseous extinguishing system, and b) The advantages offered by gaseous extinguishing systems.*

When you examine the range of marks awarded to the candidates for this question it becomes obvious that only the minority held sufficient knowledge that would have secured a pass for this question. All to often it was apparent that candidates had failed to read the question and realise that what was being asked for was the key components and advantages of Gaseous extinquishing systems. Why was it then that many submitted scripts detailing CO2 extinguishment, and scant information of what was required. This is a common question and this subject must therefore be reviewed and remembered before any future attempt is made at this paper.

**Question 2:** *Discuss the purpose of carrying out fire evacuation drills, and detail how they should be conducted to ensure that the drill is effective.*

This is a question that appears with rapidity throughout the fire engineering examination and it was therefore reassuring that so many candidates achieved a comfortable pass. Those submitted scripts that had a logical approach to the answer generally scored well but for a few, marks were lost by those who mixed up operational training drills with fire safety evacuation drills.

**Question 3:** *It is a commonly held belief that there is a direct conflict between the requirement for security and those for means of escape. Briefly discuss the problems that can arise and suggest options that are available to secure both security and means of escape.*

At Graduate level it was generally anticipated that candidates would have been better prepared for this type of question and would have been competent in the subject to have been able to submit scripts in a lot more detail than was actually produced on the day.

The potential conflict between security and means of escape is clear, as are options available to overcome the conflict. This year's candidates attention is therefore drawn to the Croner Guide to Fire Safety, page 94/95.

**Question 4:** *Write a short article (approx 300 words) for a local newspaper, targeted at local businesses, to highlight the preventative measures that can be taken against arson attack.*

Newspaper articles require brevity, clarity and a simple message if they are to be successful. Therefore, good marks were awarded to those who obviously had a flair for this approach and who's answers covered the salient points within the model answer.

**Question 5:** *In investigation of the cause of fire, explain how the scene should be approached and the excavation carried out.*

This year there were a lot of people who hold an in-depth knowledge of the principles of fire investigation. It was therefore disheartening to see so many lose marks by not complying with the requirements of the question. The question was clearly aimed at the excavation of the fire scene, only the minority appreciated this and produced logical answers which considered such issues as radius of error, identification and accountability for all items recovered etc.

**Question 6:** *a) Outline the purpose of carrying out fire risk assessments; and b) In carrying out the assessment what five main functions need to be considered.*

As with the Members question regarding risk assessments it remains disappointing that so few candidates hold sufficient knowledge of this subject to warrant a pass. Probably in desperation candidates switched their concentration towards operational risk assessments rather than the fire safety route, being requested. These candidates not only wasted valuable time but achieved no marks. Candidates must read the question, understand what is being asked for and relate it to the subject matter of the examination, before attempting to answer.

**Question 7:** *A modern single storey night club has a public floor space area measuring 60 metres x 35 metres. Using an evacuation time of 2.5 minutes and occupancy factor of 0.5; calculate: a) the occupancy capacity b) the number of units of exit width required c) the minimum number of exits required d) the size of the exits*

Candidates could have thought they were sitting the science paper. This question involved simple mathematics and formula. For those candidates who remembered this formula and where able to correctly apply it, easy marks were available. It was interesting that no candidate mentioned the 45% rule within their answer and many incorrectly applied the formula which generated incorrect answers. Candidates should, whenever this type of question is produced, use a calculator to verify the answers submitted.

**Question 8:** *Outline the design features, installation criteria and purpose of a typical dry riser.*

Each year in giving this report, the common theme is the candidates failure to answer the question being asked. Once again, here, it was surprising how many candidates misread the question and described wet and dry sprinkler systems rather than rising mains. There were, however, a minority whose scripts contained accurate and detailed descriptions with accompanying diagrams and for these candidates an easy pass mark was achieved.

**Question 9:** *a) Name and define the principal loads on a building. b) Which of the principal loads are variable and which are constant? c) What is the purpose of the 'Factor of Safety' applied in calculating loadings on buildings?*

This was one of this years favoured questions, with the majority of candidates achieving a pass. This aside there was a noticeable absence of information with the third part of the question and due to the regularity that this question is included in the examinations, it is recommended that candidates review this part of the subject as part of any future revision programme.

**Question 10:** *Outline the measures you would recommend to prevent smoke and fire spread throughout a building via mechanically operated ductwork systems.*

At this level of the examinations it is expected that candidates are able to demonstrate their knowledge of this subject by explaining, albeit in brief detail, each of the points required rather than producing bullet point lists. The areas that are covered in the model answer are points such as appreciating ductwork penetrates compartmental walls and requires fire stopping, understanding that ductwork systems can include air conditioning, dust extraction, solvent extraction and mechanical chutes. The full answer can be found within pages 170-173 of the Manual of Firemanship Book 8.

## PAPER 2A - OPERATIONS

**Question 1:** *Outline the general points that should be included in a 'fire plan' that has been designed to assist Senior Fire Brigade Officers in dealing with a woodland or forest fire.*

This was a popular question that on the whole was well answered by candidates. The areas that were well understood were the access to the fire and limitations on available water supplies and the number of firefighters and the necessary equipment required at the preliminary stage of this type of incident. Where candidates did lose marks were by the

omission of information such as failing to mention fire breaks, long distance communication, the relevance to the time of year etc.

**Question 2:** *Explain the operational factors that the Officer in Charge of a serious fire in a large single storey retail store that is uncompartmented and unsprinklered should consider.*

When confronted with this question it would have been an idea to sit back and think through the possible answer in a logical manner. Few candidates adopted this approach and so missed points that should have been obvious at this level. Common areas where points were lost were, due to the uncompartmented and unsprinklered area you could expect a rapid fire growth. The influence of ventilation and breathing apparatus movements were also infrequently explained.

**Question 3:** *With reference to Demountable Units: a) Describe the basic design of the prime-mover for a 'Rolonoff' unit and b List the operational considerations when positioning individual demountable units at incidents.*

There was a reasonable approach adopted with this question, with candidates applying their practical knowledge to the question. Although this approach achieved good marks, often the necessary detail was absent. Examples of this was failing to mention gooseneck connections and locking systems. To consolidate the candidates knowledge of this subject it is recommended that Part 5 of The Manual of Firemanship Book 5 be reviewed as part of the post examination revision programme.

**Question 4:** *Describe the techniques that can be used during fire fighting to reduce the dangers of explosion in premises where dusts or powders may be encountered.*

All to commonly candidates attempting this question went off on a tangent and their submitted answers did not always include issues such as water sprays, awareness crews, use of Hi-ex foam. Instead answers principally focused on ventilation and spark proof equipment. Candidates are reminded to read and understand the requirements of the question and to structure their answers.

**Question 5***: When using foam to fight a liquid fire: a) What factors contribute to the extinguishing of the fire? and b) Explain the following terminology in relation to foam: i. Expansion. ii. Shear stress.*

From the depth of knowledge that came through from the answers, there did appear to be a lack of understanding regarding the use of foam. Blanketing and smothering were adequately covered but there were no references to the interception of radiated heat or the dilution of air/oxygen by water vapour.

**Question 6:** *With the aid of a diagram show the passage of water through a two-stage centrifugal pump and briefly describe the relationship of pressure and velocity as water passes each stage*

A question that was designed to bring out the artist in us. In the majority of cases that was exactly what happened, submitted scripts contained excellent diagrams, which were well labelled and mentioned volutes and kinetic energy converting to pressure energy.
My only comment for future improvement to produce diagrams, that not only answer the requirements of the question but also adequately demonstrate the candidates knowledge of the subject.

**Question 7:** *To assist accident investigation agencies 'post-accident discipline' is essential in helping to preserve the scene at a passenger aircraft crash. Describe the responsibilities of fire brigade personnel in this vital area.*

I expect that due to the media interest that naturally surrounds aircraft incidents, candidates were all aware of the importance of the 'black box recorder'. What, however, was not covered in the majority of scripts were things like the importance of the control of the area and the need to record what actions had been taken.

This was an unpopular question which unfortunately was reflected in the generally low achieved marks. Candidates must therefore remember to study the subject prior to attempting this or the Member paper next year.

**Question 8:** *Describe a high pressure hose reel system used for fire-fighting purposes.*

This should have posed the candidate little problem as high pressure hose reels are the chosen fire fighting media for the majority of fire engineers. Candidates should have noticed that the question did not focus on the hose reel and drum, unlike the majority of answers. The

question was looking for a description of the methods employed to produce the high pressure. The main reason why the candidates who attempted this question failed to achieve a pass mark was because their answers were restricted to the former.

**Question 9:** *As the Officer in Charge of a multiple road traffic accident in which a number of people are trapped, list the points you would have to consider in dealing with the incident.*

It is time consuming, not only for the marker, but also the candidates who generates pages of irrelevant information when really what was required could have been better achieved by structuring their answers, mentally moving through each stage that would be confronted by the Officer in Charge at this type of incident.

**Question 10:** *A number of different fire fighting systems, both fixed and portable are available for use on oil tanker ships. Briefly explain each of these systems.*

This was a subject that candidates were clearly not conversant with. The subject is adequately covered in The Manual of Firemanship and an article in the January 1999 Fire Engineers Journal. Answers could have included the following types of systems:

1. Portable and wheeled fire extinguishers
2. Fire water mains and pumps
3. Foam fire fighting systems
4. Carbon dioxide
5. Steam smothering

## PAPER 2C - OPERATIONS – AERO STUDIES

**Question 1:** *a) List the types of aviation fuels in use b) What are the physical properties of these fuel's c) What are the general features of burning aviation fuel.*

When candidates obviously demonstrate a good understanding of the questions subject, it is disappointing that sufficient detail is not provided to achieve higher marks. With a more structured approach and a bit more thought I am sure candidates would have remembered other points that were required by the question.

**Question 2:** *a) Describe the various types of engines, give a brief description of how they work and what hazards are associated with them. b) List the zones found in a "JET" engine. Which of these zones has the highest risk factor and why.*

This was a popular question that generally was answered well by candidates. Some candidates lost marks by failing to provide sufficient knowledge regarding the four zones of the a/c engine and by failing to understand why in particular the 'accessory section, zone four' is the most dangerous.

It is, therefore, recommended that candidates include this subject in any post examination revision.

**Question 3:** *List the normal procedures to be implemented when fuelling aircraft*

It was apparent that some candidates had not grasped the requirements of this question as they appeared confused and submitted answers focusing on refuelling aircraft when passengers were on board etc. Clearly this type of circumstance would not be the norm. Candidates must, therefore, better familiarise themselves with this subject prior to attempting this type of question again.

**Question 4:** *a) List the physical Properties of the 4 main types of foam concentrate in use. b) Detail the characteristics of any two.*

Read the question, is the advice here. Understand what is being asked of you and approach the answer in a structured manner. Candidates did not focus their thoughts so answers tended to wander and waffle between the various types of foam concentrates. Failing to understand the second part of the question wasted examination time for candidates who described the characteristics of all four of the foam types.

**Question 5:** *Where an airport is situated near large expanses of water, special provisions should be made for the eventuality of an aircraft accident in the water. Detail the following: a) the possible hazards associated with this type of incident b) the specialist equipment/personnel which may be required c) the fire-fighting techniques used in such an event.*

This question was not attempted by any candidates. It can only, therefore, be inferred that candidates had failed to include this

subject in their preparation for this examination.

**Question 6:** *Hazardous goods may be transported by air, list the different classification and divisions of dangerous goods.*

This was a popular question and candidates demonstrated an acceptable understanding of the subject to achieve very good marks. Unfortunately, although infrequently, marks were lost by failing to list the sub division of the classifications.

**Question 7:** *a) Describe the categories of heliports stating in your answer the minimum amount of extinguishing agents to be provided for surface level heliports. b) Discuss the response time requirements for fire and rescue personnel at elevated heliports.*

It was envisaged that by the use of the highlighted words, candidates would focus on what the question was asking. In reality no candidate attempted the question, which I feel demonstrates a lack of knowledge for this specific subject. The categorisation of heliport should have been seen as a 'bread and butter' question and, therefore, it cannot be over emphasised that candidates must be familiar with its concept.

**Question 8:** *List the possible hazards associated with aircraft undercarriage assemblies and describe the firefighting action for such an incident.*

A popular question that rarely produced anything other than average marks. Marks were all too commonly lost for omitting actions like, the consideration of passenger evacuation or the introduction of thermal shock. Candidates must, therefore, make themselves familiar with the relevant reference material.

**Question 9:** *Describe in detail the main metals used in aircraft construction, indicating their location in construction and how each reacts in fire situations.*

A mixed reaction to this question. On the one hand candidates demonstrated a fair knowledge of the different types of metals used, but then failed to impress the marker regarding their location and how each would react in a fire situation.

It was all too common to read through scripts that lost the majority of available marks by concentrating purely on the array of aluminium alloys.

**Question 10:** *Detail the number and types of exits that should be provided for each side of an aircraft fuselage according to its passenger carrying capacity and describe the type of exit, location and its size.*

This subject proved beyond the capabilities of this years candidates and, therefore, what should have been seen as a relatively easy question was overlooked.

## PAPER 3 - FIRE ENGINEERING SCIENCE

**Question 1:** *Data may be expressed in the form of Graphs, Bar Charts or Pie Charts. Explain, using suitable examples, the reasons for using each one and the differences between them.*

*By reference to the above methods explain the meaning of extrapolation and interpolation.*

Some reasonable answers were submitted. However, throughout the submitted scripts there were some common threads where candidates lost marks. Candidates spent too much time showing calculations that were not required, the reasons why these graphs and charts are used was an area that candidates failed to demonstrate and there was confusion over extrapolation and interpolation.

Candidates would have benefited on this occasion by setting out their answers in a methodical manner. This would have make it easier to highlight all the relevant parts of the answer.

**Question 2:** *Calculate the efficiency of a hydraulic lifting system which will lift 4 x 5 litre vessels of sulphuric acid of density 1200 kg/m3 to a height of 5 metre above the ground in a time of 20 secs.*

*Assume the pump operating the lift is using 15 amps on a 11 KV volt supply.*

The question was a popular choice but poorly answered. A lot of marks were lost because candidates failed to show all their calculations. Candidates who set out the answers in a logical manner, showing how they achieved each section gained marks. In the era of the calculator it is important to show all working

so that in the event of a mistake the marker can trace the error and marks can be awarded for the correct areas.

**Question 3:** *Calculate the total pressure loss at the end of a hose line 75 metre long that is being used 25 metre above pump level. (the friction factor is 0.007 and the velocity in the 75mm hose is 4 m/s.)*

This question was generally well answered and it was obvious that many candidates held an excellent knowledge regarding this type of question. Some faultless answers were submitted. As with any type of question demanding the use of formula, all too often candidates either used the wrong formula or failed to show all calculations. The calculation was quite involved with many stages and if a methodical approach had been adopted candidates would have more readily appreciated what was required.

**Question 4:** *Describe the operation and characteristics of the transformer as used in the distribution of electricity.*

This question was poorly answered. Many marks were lost because candidates failed to give a full description of how a transformer operated. Candidates who explained how a transformer could be used to step voltage either up or down and how this fitted into the electricity distribution system, gained marks accordingly. Candidates should adopt a logical approach to their answers and, where appropriate, illustrate by the use of diagrams.

**Question 5:** *If 25 litres of steam at 100°C are passed into 5 litres of water at 20° C what will be the resulting temperature of the mixture.? (Latent heat of steam - 2260 KJ/kg) (Specific heat capacity of water = 4200 J/kg) (Density of steam = 0.72 kg/m3)*

It was unfortunately all too obvious that the majority of candidates that attempting this question, had little idea of how to approach the answer. Few candidates appreciated that heat loss equalled heat gain and all too often the wrong formula was used with disastrous effects.

**Question 6:** *(a) Describe the process known as Radioactivity. (b) Explain how the particles and rays are produced and compare their penetrating power.*
A question in two parts which was generally well answered with candidates showing a good knowledge of the process of radioactivity. Marks were unnecessarily lost by candidates who referred to Alpha and Beta as rays when, of course, they are generally regarded as particles. Part two was well answered with candidates demonstrating the difference between the penetrating powers of Alpha and Beta particles and that of Gamma rays.

**Question 7:** *(a) Balance the chemical equation for the combustion of propane in oxygen and by reference to this reaction define the meaning of stoichiometric conditions. (b) Calculate the volume of water produced from an 18 litre bottle of pressurised propane when it has all burnt under stoichiometric conditions. (m3 of free vapour per litre of liquid = 0.249)*

Many candidates failed to achieve a pass mark because they obviously did not understand the question. Some candidates who did understand the subject failed to calculate the quantity of water produced (17928 litres of H20). If candidates applied more time to understanding balancing chemical equations, and the meaning of stoichiometric conditions, then their next attempt at this type of question would produce a stronger pass mark.

**Question 8:** *(a) By the use of a simple diagram outline the combustion process referring in your answer to the terms free radicals, transition region and branching chain reaction. (b) By reference to this diagram explain the principles involved in the extinction of fire as defined in the fire tetrahedron.*

A two part question that was, in the main, answered poorly. Candidates answered part (b) reasonably well, explaining how fire is extinguished by the removal of any part of the tetrahedron. In part (a) of the question many candidates failed to use a diagram to explain their answers and lost marks unnecessarily. A neatly drawn diagram correctly annotated can be worth a thousand words.

**Question 9:** *Calculate the pressure produced at a 25 mm branch when water is flowing through a 90 mm hose with a velocity of 4 m/s.*

A popular question with many candidates securing an easy pass mark. The model answer required the candidate to calculate the flow in the hose Flow in hose $L = \underline{vd2}$
And then use this information to calculate the pressure at the branch.

**Question 10:** *What temperature will be generated in a chip fat fryer containing 15 litres of oil at 15° C (density 750 kg/m3) when electricity passes through a heater of 25 ohms resistance on a 220 volt supply in 30 minutes. (Specific heat capacity of oil = 2520 J/kg °C)*

This question was well answered by a large number of candidates. Marks were lost however by candidates who failed to show all calculations and formulae. Candidates who worked logically showing how they obtained the mass of oil, heat generated by electricity, heat gained by the oil and using this information conclude with an answer gained the necessary marks.

## PAPER 4 - HUMAN RESOURCE MANAGEMENT

**Question 1:** *Describe the roles a 'manager' may have in an organisation and briefly summarise the four key management activity groups which indicate what managers do in practice*

This question was answered extremely well and candidates responded accordingly by pinpointing the following key points: 1. Planning; 2. Organising; 3. Motivating; 4. Controlling

Clearly students were adequately prepared and this was reflected in the high marks achieved.

**Question 2:** *Define the terms:*

*(i) Grievance*
*(ii) Bench Marking*
*(iii) Delegation*
*(iv) Mission Statement*
*(v) Mediation*

As with the previous question this was very popular with candidates. On the whole the majority who attempted this question achieved a satisfactory pass mark, the only consistent area where points were lost was with the definition of 'bench marking', to which the model answer says 'comparing the organisations standard of performance in one or more aspects of strategy (or operations) in terms of that of a first class competitor or comparable organisation'.

**Question 3:** *(a) Describe what you understand by a system of management by objectives and (b) Discuss what you think are the advantages and disadvantages of such a system.*

This question clearly favoured those who had 'done their homework' and these candidates achieved high marks. At the other end of the scale there were those who were incapable of separating out the specifics of (MBO) from the general principles of management, or who confused (MBO) with TQM. This is a common question and candidates must therefore make themselves familiar with its concepts.

**Question 4:** *Summarise the basic principles of an effective job advertisement (ie, one that attracts sufficient numbers of the right kind of candidates).*

This was a generally well answered question. Candidates who had read and understood the question offered summaries which included items such as:

1. The requirement, nature of the job
2. The requirements of the applicant
3. The process of application

The comprehensive answer can of course be found within the associated bibliography. Marks were lost however by a minority of candidates who by mistake provided an example of an advertisement for a specific post, rather than what was being asked for. Read the question!

**Question 5:** *Most managers are called upon from time to time to make a presentation to colleagues or superiors.*

*Detail elements of good practice in the making of presentations.*

This was a very popular question, that allowed candidates the opportunity to draw upon their own practical experiences to achieve an adequate pass mark. On occasions candidates tended to dwell on the desirable points rather than focusing their efforts towards the essential issues surrounding presentations.

**Question 6:** *Describe what should be included in an employee written statement of their main terms of employment.*

This question quite naturally lent itself towards the formulation of a list answer. In hindsight, thinking logically, points such as the date employment commences, rate of remuneration, hours of work etc, would have easily achieved an adequate pass mark.

For those unfortunate candidates who had failed to read the question and who had struggled producing answers that primarily

focused on job descriptions/person specifications, little marks were available.

**Question 7:** *(a) Illustrate with a diagram the basic cycle of 'systematic training'. and (b) Identify the benefits of systematic training.*

Training Policy
Establish Training Organisation
Identify Training Needs
Evaluate Training
Plan Training Required
Carry out Training

If candidates had produced this diagram in part A of the question then 10 of the available 20 marks would have been awarded. Adopting a logical approach would have gained additional marks in part B. Despite this being a relatively easy subject it was even more disappointing that 10% of attempts scored zero points because candidates had not read the question and directed their answers towards what was being asked for.

**Question 8:** *Describe what employers can do to help employees who are suffering from work related stress.*

For such a debilitating work related illness it was surprising how few of the candidates could demonstrate sufficient knowledge on the subject to achieve a pass mark. The question was not asking for the causes of stress, it was asking for what measures could be taken by the employers to mitigate the effects of work related stress. Good answers would therefore naturally include such measures as:

1. Review the individuals job responsibilities
2. Set agreed job targets for employees
3. Put a stop to bullying/harassment

**Question 9***: Identify the various types of leader and consider some of the practical difficulties associated with each type.*

Despite this being one of the least liked questions in this years paper, surprisingly very high marks were awarded by the majority who attempted it. There were five types of leader:

1. Charismatic
2. Traditional
3. Situational
4. Appointed
5. Functional

Points were lost by candidates who failed to give examples of people within each group.

**Question 10:** *Describe the points a manager needs to be aware of to make optimum use of the time available in a selection interview.*

Between the marks of 0-15 it was interesting to note that the number of candidates achieving each mark were approximately the same. This certainly seems to demonstrate a fluctuation of knowledge demonstrated by the candidates. What ever question you attempt in any examination it is clear that if you do not read and understand the question, yet still attempt to answer offering pages of irrelevant information, you will not score very well. For the majority this was certainly the case with their answers.

# 2005 IFE Examination Details

*The Rules, Regulations and Syllabuses, together with examination application forums can be downloaded from the IFE website at www.ife.org.uk*

## TIMETABLE

### Membership Examination

**Thursday March 10th 2005**

**am** Membership Examination Paper 1 (Fire Engineering Science)

**pm** Membership Examination Paper 6 (Fire Service Operations)
Membership Examination Paper 7 (Aero Fire Studies)
Membership Examination Paper 8 (Fire Investigation)
Membership Examination Paper 9 (Marine Fire Studies*)
Membership Examination Paper 10 (Petrochemical Fire Studies*)
Membership Examination Paper 11 (Disaster Planning & Emergency Management*)

**Friday March 11th 2005**

**am** Membership Examination Paper 5 (Human Resource Management)

**pm** Membership Examination Paper 2 (Fire Safety)

Note:- Paper 4 Building Construction and Paper 12 Communications, both optional are no longer offered.

*These papers whilst still included in the options list will only be offered in 2005 subject to there being sufficient demand. Candidates considering entering any of these three papers are therefore advised to nominate an alternative paper from the other three optional papers. An advice will be sent should any of these papers be withdrawn as soon as possible after the closing date.

### Graduate Examination

**Thursday March 10th 2005**

**am** Graduate Examination Paper 1 (Fire Safety)

**pm** Graduate Examination Paper 2A (Operations)
Graduate Examination Paper 2C (Aero Fire Studies)

**Friday March 11th 2005**

**am** Graduate Examination Paper 3 (Fire Engineering Science)

**pm** Graduate Examination Paper 4 (Human Resource Management)

Note:- Paper 2b Operations/Control Communications is no longer offered.

### Intermediate and Preliminary Examinations

**Thursday March 10th 2005**

**am** Preliminary Examination
Intermediate Examination (Paper 1)

**pm** Intermediate Examination (Paper 2)

## EXAMINATION FEES 2005

Examination fees for the 2005 Examinations are as follows:

All examinations.....£31 per paper (see notes below)
Notes: The Intermediate examination will cost a total of £31 if both parts are taken in the same year, otherwise the cost is £31 per section
If applying for four papers in one sitting, the fee is £100

IMPORTANT NOTE: *The closing date for the receipt of applications from candidates outside the UK is October 31st, 2004, and November 30th, 2004 for the UK and Republic of Ireland candidates*
*It is incumbent upon all Branch Secretaries and individuals to ensure that applications, together with a remittance of the correct fees, are sent well in advance of the closing dates mentioned above. This is particularly important for candidates residing outside of the United Kingdom in countries where exchange control operates and official approval is required for the remittance of funds.*

***Candidates are reminded that they must be current members of the Institution in the appropriate grade, that is to say, they must have renewed their membership for the membership year 2004 when applying, also the subscription due 1st January 2005 must have been received prior to sitting the examinations.***

***Applications received after the closing dates mentioned above will NOT be accepted.***

*Application forms must be fully completed and legible to avoid errors and delay. Preferred examination centres should be stated although it may not always be possible to comply with a request.*
*The Rules, Regulations, Syllabuses for the Examinations, together with the examination application forms can be downloaded from the IFE website at www.ife.org.uk*

***Candidates should ensure that they are acquainted with the Examination Rules, Regulations and Syllabus***