

NATIONAL EXAMINATIONS

May 2019

11-CS-2, ENGINEERING IN SOCIETY - HEALTH AND SAFETY

Three (3) hours duration

- Notes to Candidates

1. This is a **Closed Book** examination.
2. **Do any five (5) questions.**
3. **All questions are of equal value.** (Each 10 marks).
4. **Five (5) questions constitute a complete paper.** (Total 50 marks).
5. The Bonus Question (5 marks) may be completed in addition to any other five questions.
6. Not all parts of any question are of equal value as some require more detailed answers than others.
7. **Read the entire question before commencing and take note of hints or recommendations** given.
8. Full explanations or descriptions must be given in essay type answers. Point form answers should not be given unless the question requires a list or has several distinct items. Sketches may be used to support explanations and descriptions.
9. If doubt exists as to the interpretation of any question, the candidate is urged to submit, with the answer paper, a clear statement of any assumptions made.
10. One of the approved **Casio** or **Sharp** calculators is allowed.
11. **Reference information for Question 6 is given on page 5. This page is to be returned with the Answer Booklet, showing lines generated or where readings were taken and which data was used. Candidates must write their names on this page.**

QUESTION 1 PERSONAL PROTECTIVE EQUIPMENT

- (a) Identify **four** different hazards for which personal protective equipment is required.
- (b) For **each** of the **four** hazards identified in (a) above:
 - (i) Describe the type of equipment to be worn.
 - (ii) Explain the requirements for the availability and wearing of the equipment.
 - (iii) Clarify any other safety factors (design, precautions, materials, effectiveness, comfort, etc.) related to the equipment.

[10 marks]

QUESTION 2 ELECTRICAL SAFETY

- (a) To ensure the safety of electrical workers, lockout and tagout procedures are used. Describe 'lockout' and 'tagout' and explain the difference between them. Describe devices used for lockout and explain how they would be used.
- (b) Explain what is meant by the grounding of electrical equipment and why it is necessary. Clarify the difference between the ground wire and the neutral wire of a typical electrical circuit. Describe a ground fault circuit interrupter (GFCI or simply GFI) and explain how it works and how it serves as a protection.

[10 marks]

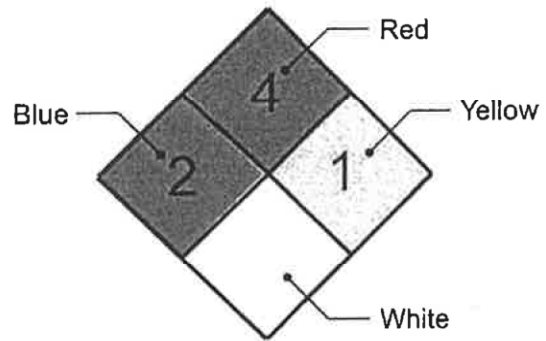
QUESTION 3 FIRE PROTECTION

- (a) There are four classes of fires. The classification scheme helps to determine suitable agents in extinguishers for different fires. Name the four classes and state the type of fires included in each class.
- (b) For each class of fire explain giving reasons what type of extinguishing agent can be used or must not be used.
- (c) Name different agents (not equipment) which are used in various fire suppression systems to control the spread of fire and explain how they work to suppress the fire.

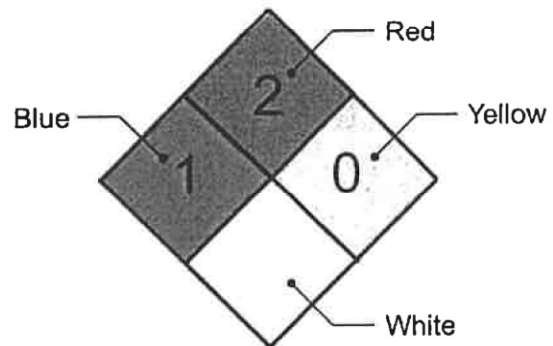
[10 marks]

QUESTION 4 HAZARDOUS MATERIAL

- (a) The NFPA symbol system of for identification of hazards of materials consists of a red, blue, yellow and white diamond with numerals in the coloured blocks as shown in the adjoining diagram. Explain what the colours signify and what the numbers indicate.



- (b) A truck carrying hazardous material is involved in an accident resulting in the engine of the truck catching fire and beginning to spread to the truck contents. Fire fighters arriving on the scene are concerned about the possible danger in extinguishing the fire. The truck bears a hazard diamond as shown in the adjoining diagram. Describe what danger the fire crew may be subject to and what precautions should be taken. Assess what type of material might be in the truck. *For (b) only: Blue is 1, Red is 2, Yellow is 0 (if black and white reproduction is poor)*



[10 marks]

QUESTION 5 IMPORTANCE OF SAFETY

- (a) State the **three** main reasons of safety in engineering
- (b) Give examples of each of these **three** reasons for safety
- (c) Consider the planning, design, construction, commissioning and operation of a chemical production plant. With regard to safety explain the technical and social responsibilities of an engineer in charge of such activities, in what way these responsibilities are important and who would be impacted by a lack of consideration for safety in these areas.

[10 marks]

QUESTION 6 RISK ASSESSMENT

Refer to the **Examination Paper Attachments Page 5 Risk Assessment**

You travel by car to your work 20 km away every weekday on a single lane highway with a speed limit of 80 km/hr. You go skydiving from a single engine aircraft with one jump at the local flying club every Sunday.

- (a) Using the chart on Page 5 evaluate the risk (risk score) of these two activities. Show by drawing lines on the chart how you obtained the answer. *The existing lines show the method to be used.*
- (b) Explain, with specific details, how you can reduce the risk of these two activities.
- (c) For each activity clarify, with specific examples, which of these activities is more prone to accident by human error or by equipment failure.

[10 marks]

QUESTION 7 SAFETY MANAGEMENT

- (a) Safety management in an organisation involves a number of distinct aspects, one of which is a Safety Audit. Explain what is meant by a Safety Audit and what its purpose is.
- (b) Consider a manufacturing plant making small power tools. Besides forming and cutting, there are facilities for chemical cleaning and paint application. A Safety Audit of the plant is required. You have to draw up a list of questions to be answered or verified on an audit form. Provide a list of at least 10 questions (but not more than 20) that should be on the audit form. *The questions should be concise and cover a broad range of manufacturing activities.*

[10 marks]

BONUS QUESTION

It is a well proven but not readily recognised fact that rules provide freedom. In the context of Health and Safety write a short and convincing essay of 300 words (approximately one page) under the title of "Rules provide Freedom"

[5 marks]

EXAMINATION PAPER ATTACHMENTS

Name

QUESTION 6 RISK ASSESSMENT

Use the diagram below to assess the risk of the two activities defined in Question 6.

Return this page with the answer booklet

