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## NATIONAL EXAMS MAY 2017

### 04-Env-B1, Environmental Assessment and Management Systems

**3 hours duration**

#### NOTES

1. 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.
2. This is a CLOSED BOOK EXAM with a 2-sided ( $8\frac{1}{2}'' \times 11''$ ) AID SHEET prepared by the candidate allowed.
3. The candidate may use one of two calculators, the Casio or Sharp approved models. Note that you must indicate the type of calculator being used. Write the name and model designation of the calculator on the first inside left hand sheet of the exam work book.
4. Any five (5) questions constitute a complete paper. Only the first five (5) answers as they appear in your work book(s), will be marked.
5. Each question is equally weighted at twenty (20) points for a total of a possible one-hundred (100) points for a complete paper. The detailed marking scheme is provided on page 6.

### Problem 1

Provide answers to the following questions related to *resource problems and design* with consideration of *ecological, economic, demographic and social dimensions*:

- (10) (i) It has been advocated that addressing the global phenomenon of deforestation with destruction of wildlife habitat and animal extinction depends on designs for optimal use and recycling of resources within a multidisciplinary approach. Give one (1) example where environmental engineers may optimize engineering designs of a resource utilization project within the forestry industry by integrating ecological, economic and social issues into the engineering design. You may use a table to organize your answer.
- (10) (ii) Municipal engineers and planners have given preliminary approval for an expansion of a mine tailings pond for a gold mine in northern Quebec subject to the submission of an environmental impact assessment. Briefly explain three (3) key issues [one (1) each from ecological, economic and social dimension] that should be included in the impact assessment report to facilitate the final approval of the site expansion. You may use a table to organize your answer.



### Problem 2

Answer the following questions related to *environmental audits, environmental management systems (EMS)* and *geographical information systems (GIS)* :

- (10) (i) Briefly explain four (4) key differences between an environmental management system (EMS) and an environmental audit.
- (10) (ii) Provide an engineering example and identify three (3) important areas where GIS can be used to inform and reduce potential environmental impacts of the establishment of a large dam for hydro electric power generation.

### Problem 3

Provide answers to the following questions related to *techniques to integrate knowledge and define policy and risk analysis*:

- (10) (i) Provide and explain the use of three (3) techniques to integrate various sources of knowledge to define an environmental policy. In your explanation, consider the use of fossil fuels and renewable energy sources, where stakeholder interests are varied and conflicting. Your techniques should ensure that all stakeholder input was integrated in the final policy adopted.
- (10) (ii) Explain how risk analysis techniques or methodologies may affect regulations to control air emissions from the expansion of an industrial park situated near a large residential community. In your explanation, include three (3) important aspects of risk analysis.



### Problem 4

Provide answers to the following questions related to *principles of sustainable development, design of controlled environments and protection of natural resources for sustainable development*:

- (10) (i) Briefly explain three (3) principles of a sustainable development plan that can assist the prosperous development of a gold mine while ensuring the protection and sustainability of a natural cold water fishery located in the same watershed.
- (10) (ii) Controlled-environment aquaculture (CEAQ) is an example of a controlled environment design towards improved food production. The aim of CEAQ is to ensure a sustainable high quality food production while minimizing environmental impacts. Explain three (3) benefits and three (3) engineering challenges associated with CEAQ.

### Problem 5

Provide answers to the following questions related to *life cycle analysis (LCA)* and *risk management (RM)*:

- (10) (i) Using a clearly labelled schematic, identify four (4) key stages of a life cycle analysis (LCA), explain its general purpose and provide an engineering example showing two (2) environmental advantages in using the LCA approach.
- (10) (ii) A report from the Harvard Business Review on Environmental Risk Management (ERA) stated that, “Strong risk management creates a positive operating environment for companies, minimizing or eliminating damage to the environment or to neighbours”. Explain four (4) key ERA processes in a clearly labelled diagram and provide an engineering example to demonstrate that the above statement is justified.



### Problem 6

Provide answers to the following questions related to following areas: *environmental impact assessment applied to solid waste management, effluent control and air pollution control*:

- (7) (i) Consider a landfill site for solid waste from a municipality expected to double in population over the next ten years. Describe three (3) key issues in an environmental impact assessment that will minimize environmental impacts from a leachate plume impact on the local groundwater.
- (6) (ii) Hydraulic overload at sewage treatment plants during major storm events often results in poor effluent control. Provide three (3) engineering methods that can be applied to improve the effluent quantity and quality controls during peak flow events.
- (7) (iii) Provide an example of one (1) technical and two (2) non-technical solutions to reduce toxic volatile air emissions from an industrial plant located near a large residential community.

### Problem 7

Provide answers to the following questions related to *applicable federal, territorial or provincial environmental legislation* and *analysis of environmental impacts using technical and non-technical parameters*:

- (10) (i) Give an example of a federal, territorial or provincial environmental legislation and briefly explain how compliance, abatement and enforcement are three (3) important elements of the environmental legislative framework necessary to ensure environmental protection.
- (10) (ii) Describe the use of two (2) indicators from an environmental impact analysis to mitigate flooding and erosion in a natural wetland wildlife habitat associated with upstream residential intensification. Consider that valuable water resources and natural habitats may be impacted. In your description, briefly compare the relative effectiveness of technical versus non-technical approaches by taking into account the costs and benefits of each approach. Use a table to organize your answer.



## Marking Scheme

1. (i) 10, (ii) 10 marks, 20 marks total
2. (i) 10, (ii) 10 marks, 20 marks total
3. (i) 10, (ii) 10 marks, 20 marks total
4. (i) 10, (ii) 10 marks, 20 marks total
5. (i) 10, (ii) 10 marks, 20 marks total
6. (i) 7, (ii) 6, (iii) 7 marks, 20 marks total
7. (i) 10, (ii) 10 marks, 20 marks total