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**NATIONAL EXAMS MAY 2016**

**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.

### 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 phenomena of climate change depends on designs for optimal use and recycling of resources with consideration of a multidisciplinary approach. Give one (1) example where environmental engineers may optimize engineering design of a resource utilization projects (e.g., mining, fossil-fuel recovery, forestry) by integrating ecological, economic, demographic and social issues into the engineering design. Use a table to organize your answer.
- (10) (ii) Municipal engineers and planners have given preliminary approval for the expansion of a landfill site subject to the submission of a development impact assessment. Briefly explain four (4) key issues [one (1) each from ecological, economic, demographic and social dimension] that should be included in the impact assessment report to facilitate the final approval of the landfill site expansion by the municipality. Use a table to organize your answer.

### Problem 2

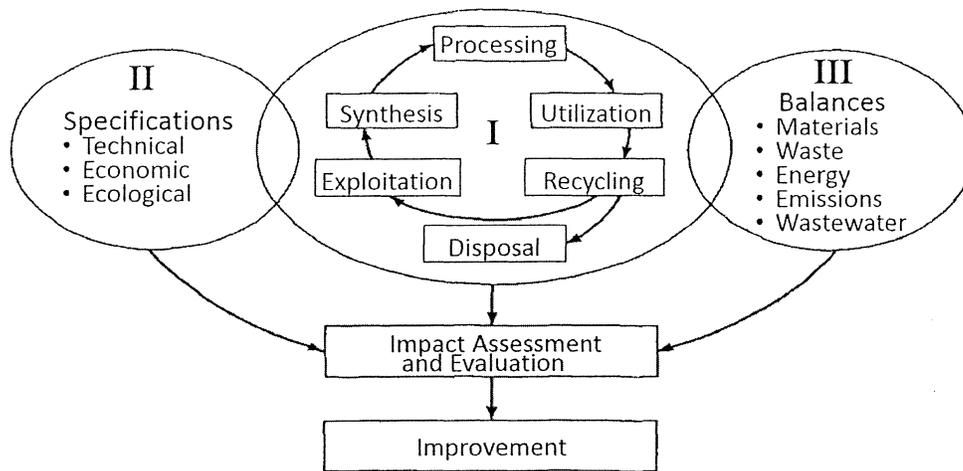
Provide answers to the following questions related to *techniques to integrate knowledge and define policy* and *risk analysis*:

- (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 fossil fuels or industrial fishing operations, where stakeholder interests are varied and conflicting. Your techniques should ensure that all stakeholder input was reflected in the final policy adopted.
- (10) (ii) Explain how risk analysis techniques or methodologies may affect regulations to control provincial effluent standards from municipal wastewater treatment plants near fishing and recreational swimming areas located downstream of the effluent discharge. In your explanation, include three (3) important aspects of risk analysis.

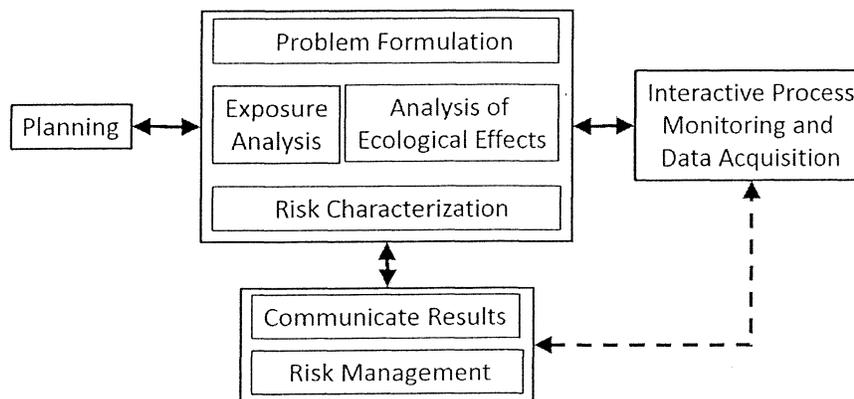
### Problem 3

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

- (10) (i) Using the diagram below provide an illustrative example to explain how using a life cycle analysis (LCA), with key areas identified in bubble I, II and III, lead to a comprehensive impact assessment and evaluation which may lead to overall improvements and sustainability in product development or utilization of resources. Select any two (2) items in each bubble I, II and III and organize your answer in a table.



- (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”. With reference to the ERA process diagram below, provide an example to demonstrate that the above statement is justified.



### Problem 4

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

- (7) (i) Briefly explain three (3) key differences between an environmental compliance audit and an environmental management audit.
- (6) (ii) Provide an engineering example and identify three (3) important areas where GIS can be used to inform engineers of the potential environmental impacts of their designs.
- (7) (iii) Environmental management systems (EMS) are intended to formalize procedures for managing and reducing environmental impacts. Provide three (3) important reasons why engineering construction firms should implement EMS.

### Problem 5

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

- (6) (i) Briefly explain two (2) principles of sustainable development that can assist engineering designs to ensure the wise use of natural resources for minimum adverse impact and maximum positive impact on people and the environment.
- (7) (ii) Controlled-environment agriculture (CEA) is an example of a controlled environment design towards improved food production. The aim of CEA is to provide protection and maintain optimal growing conditions throughout the development of the crop. Explain two (2) benefits and two (2) engineering challenges associated with CEA.
- (7) (iii) An important principle of international law related to sustainable development states that we have a duty to ensure sustainable use of natural resources. Provide an example and give three (3) ways that the above principle can be implemented through good use of technology on a national scale.

### 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 help the municipal engineers to minimize environmental impacts.
- (7) (ii) Treatment bypasses at wastewater treatment plants are common during major storm events where combined sewers are part of the sewershed resulting in degraded effluent being discharged to the receiver. Provide three (3) engineering methods that can be applied to improve the quality or reduce the quantity of treatment bypasses during major storm events.
- (6) (iii) Provide an example of a technical and a non-technical solution to reduce particulate air emissions from an industrial processing plant located within 1 km of a large residential community.

### Problem 7

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

- (10) (i) Describe the use of two (2) indicators from an environmental impact analysis to show the impacts on the hydrosphere and atmosphere from a large scale mining operation in northern Ontario. Consider that potential 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.
- (10) (ii) Provide one (1) example, of a federal, territorial or provincial environmental legislation framework and how it has been applied to prevent environmental degradation and promote sustainability. In your example, identify three (3) important criteria in the framework and how each criteria prevented environmental degradation and promoted sustainability. 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) 7, (ii) 6, (iii) 7 marks, 20 marks total
5. (i) 6, (ii) 7, (iii) 7 marks, 20 marks total
6. (i) 7, (ii) 7, (iii) 6 marks, 20 marks total
7. (i) 10, (ii) 10 marks, 20 marks total