

National Examination May 2016

04-Env-A6, Solid Waste Engineering and Management

3 hours duration

NOTES:

1. The total possible examination mark is **100**.
2. This examination is an **CLOSED BOOK EXAM**.
3. Candidates are permitted **ONE** (1) letter sized aid sheet (8.5 "x 11") both sides.
4. One non-communicating calculator (Casio or Sharp).
5. *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.*
6. All **17** questions constitute a complete paper.

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- 5 1. Define or describe briefly each of the following terms:
 - 1.1 Integrated solid waste management
 - 1.2 The 3 T's in incineration
 - 1.3 The Perfect Gas Law
 - 1.4 Darcy's Law
 - 1.5 Pyrolysis
- 3 2. Name 3 different leachate treatment processes.
- 4 3. Identify 4 problems associated with land filling of municipal solid waste.
- 3 4. Name 3 variables that govern land fill gas production.
- 6 5. Name 6 factors that affect landfill gas (LFG) production.
- 3 6. State 3 methods commonly used to estimate municipal refuse quantities.
- 3 7. What are some of the significant hazards that the generation/emission of CH₄ in landfill gas (LFG) can pose?
- 3 8. What factors must you consider in the development of a post-closure plan?
- 8 9. You have been retained by a municipality to assess the feasibility of building a waste to energy conversion plant and use this energy to supply their local industrial park. Outline in point form the approach you would take in conducting this assignment.
- 8 10. As consulting engineer you have been commissioned to conduct a risk analysis on the municipality's landfill project. Outline in point form how you would proceed.
- 10 11. Name 10 points you must address in the design and an operational plan for a landfill.
- 5 12. When is waste separation at source warranted?
- 7 13. In your first position as Junior City Engineer you are assigned by your supervisor to report on the generation rates and composition of solid wastes for various sources of your community. How would you go about it? If these data were needed in 30 days and thus you had no time to assess seasonal effects. How would you estimate this factor?
- 8 14. List in point form the steps involved in the composting operation.
- 6 15. In the generation of a healthy compost, a number of key process inputs are essential. Name six (6).

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- 10 16. Landfill mining is likely to play an important role in the future of waste management. Please provide concise answers to the following items:
- 16.1 List 4 reasons why one would consider landfill mining.
 - 16.2 Provide a list of health and safety requirements.
 - 16.3 Briefly describe items to be considered in the work plan.
- 8 17. You are the consultant to a seasonal community that hired you to generate information to be used in the development of a community solid waste management strategy. The timeline is short. Outline in point form how you would go about finding what you believe to be the best (reliable) data source(s).

100 TOTAL MARK