

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur 603203

DEPARTMENT OF MECHANICAL ENGINEERING



B.E MECHANICAL ENGINEERING

Question Bank

Regulations - 2023

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V SEMESTER

OME104 HAZARDOUS WASTE MANAGEMENT

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DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

SUBJECT / SUBJECT CODE : HAZARDOUS WASTE MANAGEMENT/ OME104
SEM/YEAR : V / III

UNIT-I: INTRODUCTION

Hazardous waste definition- Regulatory aspects of Hazardous Waste Management in India – Sources, characterization, categories - Analysis of hazardous waste -Physical and biological routes of transport of hazardous substances

PART-A (2 Marks)

Q.No	Questions	BT Level	Competence
1.	Define hazardous waste.	BT-1	Remembering
2.	State two characteristics of hazardous waste.	BT-1	Remembering
3.	List two sources of hazardous waste.	BT-1	Remembering
4.	What is hazardous waste characterization?	BT-1	Remembering
5.	Define toxic waste.	BT-1	Remembering
6.	What is ignitability?	BT-2	Understanding
7.	What is corrosive hazardous waste?	BT-1	Remembering
8.	What is reactive waste?	BT-1	Remembering
9.	What is regulatory framework?	BT-1	Remembering
10.	. Expand CPCB.	BT-2	Understanding
11.	What is hazardous waste analysis?	BT-1	Remembering
12.	List two categories of hazardous waste.	BT-1	Remembering
13.	Mention one industrial source of hazardous waste.	BT-1	Remembering
14.	What is leachate?	BT-2	Understanding
15.	Define transport pathway.	BT-1	Remembering
16.	Differentiate physical and biological transport.	BT-1	Remembering
17.	State the objective of hazardous waste management.	BT-2	Understanding
18.	What is manifest system?	BT-2	Understanding

19	Mention one environmental impact of hazardous waste.	BT-2	Understanding
20	What is groundwater contamination?	BT-1	Remembering
21	What is bioaccumulation?	BT-1	Remembering
22	Name two hazardous constituents in polluted water.	BT-1	Remembering
23	What is TSDF?	BT-1	Remembering
24	State one Indian rule governing hazardous waste.	BT-1	Remembering
25	Why is waste characterization important?	BT-1	Remembering

PART-B (16 Marks)

Q.No	Questions	Marks	BT Level	Competence
1.	Explain hazardous waste definition, classification and characteristics.	16	BT-4	Analyzing
2.	Discuss the regulatory aspects of hazardous waste management in India.	16	BT-4	Analyzing
3.	Explain the major sources and categories of hazardous waste.	16	BT-3	Applying
4.	Describe methods used for hazardous waste characterization and analysis.	16	BT-4	Analyzing
5.	Explain physical and biological routes of transport of hazardous substances.	16	BT-3	Applying
6.	Analyze the environmental and health impacts of hazardous waste.	16	BT-4	Analyzing
7.	Describe hazardous waste sampling and laboratory analysis techniques.	16	BT-3	Applying
8.	Discuss the role of CPCB & SPCBs in hazardous waste management.	16	BT-4	Analyzing
9.	Compare hazardous and non-hazardous wastes with examples.	16	BT-4	Analyzing
10.	Explain the Hazardous and Other Wastes Rules with suitable examples.	16	BT-3	Applying

11.	Describe waste minimization strategies at source.	16	BT-4	Analyzing
12.	Discuss industrial case studies on hazardous waste generation.	16	BT-4	Analyzing
13.	Explain risk assessment associated with hazardous waste.	16	BT-4	Analyzing
14.	Explain hazardous waste classification.	8	BT-4	Analyzing
	Discuss transport mechanisms for hazardous waste.	8		
15.	Explain waste analysis.	8	BT-4	Analyzing
	Discuss regulatory compliance for hazardous waste.	8		
16.	Explain integrated hazardous waste management practices.	16	BT-4	Analyzing
17.	Analyze challenges in hazardous waste management in India.	16	BT-4	Analyzing
18.	Design a framework for safe hazardous waste handling in industries.	16	BT-3	Applying

UNIT-II: HAZARDOUS WASTES MANAGEMENT

Handling, collection, storage and transport- TSDF concept -Hazardous waste treatment technologies-Physical, chemical and thermal treatment of hazardous waste–Solidification - Chemical fixation–Encapsulation–Pyrolysis and Incineration–Biological Treatment of Hazardous Waste, Hazardous waste landfills-Site selections-design and operation-HW reduction- Recycling and reuse–Hazardous Site remediation – onsite and offsite Techniques

PART-A (2Marks)

Q.No	Questions	BT Level	Competence
1.	Define hazardous waste handling.	BT-1	Remembering
2.	What is waste collection?	BT-2	Understanding
3.	Write a note on safe disposal.	BT-1	Remembering
4.	List the pre-cautions in safe storage of bio-waste.	BT-2	Understanding
5.	What is hazardous waste storage?	BT-1	Remembering
6.	State two transport requirements.	BT-2	Understanding
7.	Define physical treatment.	BT-1	Remembering
8.	Define chemical treatment.	BT-2	Understanding
9.	What is thermal treatment?	BT-2	Understanding
10.	What is biological treatment?	BT-1	Remembering
11.	Define solidification.	BT-1	Remembering
12.	Define chemical fixation.	BT-2	Understanding
13.	What is encapsulation?	BT-1	Remembering
14.	Define pyrolysis.	BT-2	Understanding
15.	What is incineration?	BT-2	Understanding
16.	What is hazardous waste landfill?	BT-1	Remembering
17.	State one criterion for landfill site selection.	BT-2	Understanding
18.	What is leachate collection?	BT-1	Remembering
19.	Define waste minimization.	BT-2	Understanding
20.	Differentiate recycling and reuse.	BT-2	Understanding
21.	What is onsite remediation?	BT-1	Remembering
22.	What is offsite remediation?	BT-1	Remembering

23	State one advantage of recycling.	BT-2	Understanding
24	Mention one hazardous waste treatment technology.	BT-2	Understanding
25	Why is TSDF important?	BT-1	Remembering

PART-B (16 Marks)

Q.No	Questions	Marks	BT Level	Competence
1.	Explain handling, collection, storage and transportation of hazardous waste.	16	BT-3	Applying
2.	Discuss the TSDF concept and its importance.	16	BT-4	Analyzing
3.	Explain physical, chemical and thermal treatment methods.	16	BT-3	Applying
4.	Describe biological treatment techniques for hazardous waste.	16	BT-4	Analyzing
5.	Explain solidification, chemical fixation and encapsulation.	16	BT-3	Applying
6.	Discuss pyrolysis and incineration with neat diagrams.	16	BT-3	Applying
7.	Explain hazardous waste landfill site selection, design and operation.	16	BT-3	Applying
8.	Discuss hazardous waste minimization techniques.	16	BT-4	Analyzing
9.	Explain recycling and reuse of hazardous waste.	16	BT-4	Analyzing
10.	Discuss onsite and offsite remediation methods.	16	BT-3	Applying
11.	Compare different hazardous waste treatment technologies.	16	BT-4	Analyzing
12.	Analyze the environmental impacts of improper hazardous waste disposal.	16	BT-4	Analyzing
13.	Design an integrated hazardous waste management system.	16	BT-3	Applying
14.	Explain TSDF and landfill design.	16	BT-4	Analyzing

15.	Explain incineration and pyrolysis.	16	BT-4	Analyzing
16.	Discuss remediation techniques with suitable examples.	16	BT-3	Applying
17.	Explain the recent advances in hazardous waste treatment technologies.	16	BT-4	Analyzing
18.	Evaluate sustainable hazardous waste management practices.	16	BT-3	Applying

UNIT-III: BIOMEDICAL WASTE MANAGEMENT

Biomedical waste–Definition– Regulatory aspects of Biomedical Waste. Sources–Classification– Waste Handling and Collection–Segregation and labeling- Treatment – autoclaving, Incineration, Chemical Disinfection – disposal - Infection control Practices.

PART-A (2Marks)

Q.No	Questions	BT Level	Competence
1.	Define biomedical waste.	BT-1	Remembering
2.	State two sources of biomedical waste.	BT-2	Understanding
3.	List the categories of biomedical waste.	BT-2	Understanding
4.	What is segregation of biomedical waste?	BT-2	Understanding
5.	Why is color coding important?	BT-1	Remembering
6.	Define biomedical waste handling.	BT-2	Understanding
7.	What is biomedical waste collection?	BT-1	Remembering
8.	State the purpose of labeling.	BT-1	Remembering
9.	Define autoclaving.	BT-1	Remembering
10.	Define incineration.	BT-2	Understanding
11.	What is chemical disinfection?	BT-2	Understanding
12.	State one disposal method of bio waste.	BT-1	Remembering
13.	What is infection control?	BT-2	Understanding
14.	Mention two infectious wastes.	BT-2	Understanding
15.	Define sharps waste.	BT-2	Understanding
16.	What is pathological waste?	BT-2	Understanding
17.	State one biomedical waste regulation in India.	BT-2	Understanding
18.	What is biomedical waste treatment?	BT-1	Remembering
19.	List two treatment technologies of bio waste.	BT-2	Understanding
20.	What is the biohazard symbol?	BT-2	Understanding
21.	Why should biomedical waste be segregated at source?	BT-2	Understanding
22.	Mention one occupational hazard in handling bio waste.	BT-1	Remembering
23.	Define Infection control Practices.	BT-2	Understanding

24.	What is Incineration?	BT-2	Understanding
25.	State the objective of Infection control Practices.	BT-2	Understanding

PART-B (16 Marks)

Q.No	Questions	Marks	BT Level	Competence
1.	A multi-specialty hospital generates different categories of biomedical waste every day. Apply the Biomedical Waste Management Rules to classify, segregate, store, transport, and dispose of the waste generated in the hospital. Explain the regulatory requirements that must be followed to ensure legal compliance.	16	BT-3	Applying
2.	Using a real-life hospital scenario, apply the Biomedical Waste Management Rules to develop a complete biomedical waste management plan, including waste segregation, color coding, collection, storage, transportation, treatment, disposal, and documentation. Discuss how regulatory compliance minimizes health and environmental risks.	16	BT-3	Applying
3.	A newly established diagnostic laboratory is planning to implement a biomedical waste management system. Apply the relevant biomedical waste regulations to design an effective waste management strategy. Explain the legal requirements, responsibilities of the occupier, and penalties for non-compliance.	8	BT-3	Applying
4.	A hospital administrator is assigned the responsibility of ensuring compliance with biomedical waste regulations. Apply the Biomedical Waste Management Rules to prepare a standard operating procedure (SOP) for handling biomedical waste from its generation to final disposal. Justify how each regulatory requirement contributes to public health and environmental protection.	8	BT-3	Applying
5.	A healthcare center has been found violating biomedical waste segregation and disposal guidelines during an inspection. Apply the provisions of the Biomedical Waste Management Rules to identify the violations and recommend corrective measures. Explain the responsibilities of the healthcare facility under the regulations.	16	BT-3	Applying

6.	Analyze the various sources of solid waste generation in urban and rural areas. Classify the different types of solid waste based on their origin, composition, and biodegradability, and discuss their impact on waste management practices.	16	BT-4	Analyzing
7.	Analyze the methods of waste handling and collection adopted for municipal solid waste. Compare door-to-door collection, community bin collection, and automated collection systems with respect to efficiency, cost, environmental impact, and public participation.	16	BT-4	Analyzing
8.	Analyze the importance of waste classification in designing an effective waste management system. Explain how improper segregation at the source affects collection, transportation, recycling, treatment, and final disposal of solid waste.	16	BT-4	Analyzing
9.	Describe the methods of waste handling, storage, segregation, and collection in urban areas. Explain the factors affecting the selection of an efficient waste collection system.	16	BT-3	Applying
10.	Analyze the different types of municipal solid waste collection systems, such as door-to-door collection, community bin collection, and pneumatic collection. Compare their advantages, disadvantages, and suitability for different locations.	16	BT-3	Applying
11.	Explain the process of biomedical waste segregation and labeling. Discuss the importance of color coding, symbols, and labeling in ensuring safe handling, transportation, and disposal of biomedical waste.	16	BT-4	Analyzing
12.	Describe the autoclaving method used for biomedical waste treatment. Explain its working principle, operating parameters, advantages, limitations, and applications in healthcare waste management.	16	BT-4	Analyzing
13.	Explain the incineration process for biomedical waste treatment. Discuss its working principle, types of incinerators, advantages, disadvantages, environmental impacts, and safety precautions.	16	BT-4	Analyzing
14.	Compare autoclaving and incineration as biomedical waste treatment methods. Evaluate their effectiveness based on waste type, cost, environmental impact, operational efficiency, and regulatory compliance.	16	BT-4	Analyzing
15.	Analyze the different types of chemical disinfectants used in healthcare settings. Explain their classification, mechanism of	16	BT-3	Applying

	action, advantages, disadvantages, and applications in infection control.			
16.	Apply the principles of infection control practices in a hospital environment. Explain standard precautions, hand hygiene, use of personal protective equipment (PPE), sterilization, and environmental cleaning with suitable examples.	16	BT-3	Applying
17.	Design a comprehensive infection control program for a 200-bed hospital. Include policies for chemical disinfection, biomedical waste management, staff training, surveillance, outbreak management, and quality assurance measures.	16	BT-4	Analyzing
18.	Explain and analyze the role of chemical disinfection in preventing the spread of infectious diseases. Compare high-level, intermediate-level, and low-level disinfectants, and discuss the factors affecting the effectiveness of chemical disinfection.	16	BT-4	Analyzing

UNIT IV RADIOACTIVE WASTE MANAGEMENT

Radioactive waste: Definition–Measurement of Radiation -Sources-Effects -Low level and high level radioactive wastes-Transuranic Waste-and their management–Uranium Mine and Tailings, Characterization – Treatment and Control - Radiation standard by ICRP and AERB.

PART-A (2Marks)

Q.No	Questions	BT Level	Competence
1.	Define radioactive waste.	BT-1	Remembering
2.	What is meant by radiation?	BT-1	Remembering
3.	State the unit used to measure radioactivity.	BT-1	Remembering
4.	List any four sources of radioactive waste.	BT-1	Remembering
5.	Mention two natural sources of radiation.	BT-1	Remembering
6.	Name two artificial (man-made) sources of radiation.	BT-1	Remembering
7.	What are the harmful effects of radiation on human health?	BT-2	Understanding
8.	Differentiate between low-level radioactive waste (LLW) and high-level radioactive waste (HLW).	BT-2	Understanding
9.	What is transuranic (TRU) waste?	BT-1	Remembering
10.	Give two examples of low-level radioactive waste.	BT-1	Remembering
11.	List any two examples of high-level radioactive waste.	BT-1	Remembering
12.	Explain the importance of radioactive waste management.	BT-2	Understanding
13.	What are uranium mine tailings?	BT-1	Remembering
14.	State the environmental impacts of uranium mine tailings.	BT-2	Understanding
15.	What is meant by radioactive waste characterization?	BT-2	Understanding
16.	Mention any two methods used for the treatment of radioactive waste.	BT-1	Remembering
17.	State the purpose of radiation shielding.	BT-2	Understanding
18.	List the basic principles for radiation protection.	BT-1	Remembering
19.	What are the functions of waste immobilization in radioactive waste management?	BT-2	Understanding
20.	Expand the abbreviations ICRP and AERB .	BT-1	Remembering
21.	State the role of the ICRP in radiation safety.	BT-2	Understanding
22.	State the role of the AERB in radioactive waste management.	BT-2	Understanding
23.	What are the radiation dose limits recommended for occupational workers?	BT-1	Remembering
24.	Why is high-level radioactive waste stored for a long period before disposal?	BT-2	Understanding
25.	Compare the management methods of low-level and high-level radioactive wastes.	BT-1	Remembering

PART-B (16 Marks)

Q.No	Questions	Marks	BT Level	Competence
1.	Define radioactive waste and explain the methods used for measuring radiation. Discuss the units of radiation measurement	16	BT-3	Applying

	and their significance.			
2.	Describe the various natural and artificial sources of radiation. Explain their contribution to environmental radiation exposure.	16	BT-3	Applying
3.	Explain the biological, environmental, and genetic effects of radiation exposure on living organisms with suitable examples.	16	BT-3	Applying
4.	Differentiate between low-level radioactive waste (LLW) and high-level radioactive waste (HLW). Discuss their characteristics, sources, and disposal methods.	16	BT-3	Applying
5.	Apply the appropriate methods for measuring radiation and explain how the measured values are used in monitoring radioactive waste disposal and environmental safety.	16	BT-3	Applying
6.	Illustrate the classification of radioactive wastes into low-level, high-level, and transuranic wastes, and explain suitable management techniques for each category.	16	BT-3	Applying
7.	Demonstrate the procedures involved in the treatment and control of radioactive waste generated from nuclear power plants using appropriate flow diagrams.	16	BT-4	Analyzing
8.	Apply the radiation exposure limits prescribed by the International Commission on Radiological Protection (ICRP) and the Atomic Energy Regulatory Board (AERB) in an industrial radiation safety program.	16	BT-4	Analyzing
9.	Explain the methods used for the characterization, treatment, and disposal of uranium mine tailings, and discuss their role in minimizing environmental pollution.	16	BT-4	Analyzing
10.	Apply suitable radioactive waste management strategies for a nuclear research laboratory generating different categories of radioactive wastes.	16	BT-4	Analyzing
11.	Analyze the various sources of radioactive waste generation and discuss their environmental and health impacts with suitable examples.	16	BT-4	Analyzing
12.	Compare and analyze low-level radioactive waste, high-level radioactive waste, and transuranic waste with respect to their origin, characteristics, hazards, and disposal methods.	16	BT-4	Analyzing
13.	Analyze the effects of ionizing radiation on humans and the environment, and discuss preventive measures to minimize radiation exposure.	16	BT-3	Applying
14.	Analyze the processes involved in uranium mining and tailings management, highlighting the environmental challenges and mitigation measures.	16	BT-4	Analyzing

15.	Analyze the principles of radiation measurement and evaluate the suitability of different radiation detection instruments for various applications.	16	BT-4	Analyzing
16.	Analyze the radioactive waste treatment process from generation to final disposal and identify the critical factors affecting long-term safety.	16	BT-4	Analyzing
17.	Evaluate the effectiveness of current radioactive waste management practices adopted worldwide and suggest improvements for sustainable disposal.	16	BT-5	Evaluate
18.	Assess the effectiveness of treatment and control technologies used for radioactive waste management in nuclear industries and recommend suitable improvements.	16	BT-5	Evaluate

UNIT-V E-WASTE MANAGEMENT

Regulatory aspects of E- Waste management, Waste characteristics- Generation-Collection - Material Composition-Transport– Treatment and disposal. Recycling and Recovery – intergraded e-waste management.

PART-A (2Marks)

Q.No	Questions	BT Level	Competence
1.	Define E-waste.	BT-1	Remembering
2.	What is meant by e-waste management?	BT-1	Remembering
3.	State any two objectives of e-waste management.	BT-1	Remembering
4.	List any four categories of e-waste.	BT-1	Remembering
5.	What are the major sources of e-waste generation?	BT-1	Remembering
6.	Define Extended Producer Responsibility (EPR).	BT-1	Remembering
7.	What are the key components of the e-waste management system?	BT-1	Remembering
8.	List any four hazardous materials commonly found in e-waste.	BT-1	Remembering
9.	Name any four valuable materials recovered from e-waste.	BT-1	Remembering
10.	What is meant by e-waste collection?	BT-1	Remembering
11.	Define recycling of e-waste.	BT-1	Remembering
12.	What is meant by recovery in e-waste management?	BT-1	Remembering
13.	State the purpose of transporting e-waste safely.	BT-1	Remembering
14.	List any two methods used for the treatment of e-waste.	BT-1	Remembering
15.	Name any two disposal methods for non-recyclable e-waste.	BT-1	Remembering
16.	Explain why e-waste is considered hazardous.	BT-2	Understanding
17.	Explain the importance of segregating e-waste at the source.	BT-2	Understanding
18.	Describe the need for proper collection of e-waste.	BT-2	Understanding
19.	Explain the significance of material composition in e-waste recycling.	BT-2	Understanding
20.	Describe the role of transportation in e-waste management.	BT-2	Understanding

21.	Explain the importance of recycling electronic waste.	BT-2	Understanding
22.	Differentiate between recycling and recovery of e-waste.	BT-2	Understanding
23.	Explain the environmental impacts of improper e-waste disposal.	BT-2	Understanding
24.	Describe the objectives of integrated e-waste management.	BT-2	Understanding
25.	Explain the importance of regulations in e-waste management.	BT-2	Understanding

PART-B (16 Marks)

Q. No	Questions	Marks	BT Level	Competence
1.	Explain the regulatory aspects of e-waste management and describe how they are implemented in the collection, transportation, treatment, and disposal of e-waste in India	16	BT-3	Applying
2.	Apply the principles of integrated e-waste management to design an effective e-waste collection and transportation system for an educational institution.	16	BT-3	Applying
3.	Discuss the stages involved in e-waste management from generation to final disposal with the help of a suitable flow chart.	16	BT-3	Applying
4.	Explain the material composition of e-waste and discuss suitable treatment and disposal methods for different categories of electronic waste.	16	BT-3	Applying
5.	Illustrate the process of recycling and recovery of valuable materials from e-waste and explain its environmental and economic benefits.	16	BT-3	Applying
6.	Describe the methods used for the collection, transportation, and storage of e-waste while ensuring compliance with environmental regulations.	16	BT-3	Applying
7.	Analyze the characteristics of e-waste and explain how its physical and chemical composition influences treatment and recycling methods.	16	BT-4	Analyzing
8.	Examine the major sources of e-waste generation and analyze the challenges involved in its collection and transportation.	16	BT-4	Analyzing
9.	Compare various e-waste treatment and disposal techniques based on efficiency, environmental impact, and cost.	16	BT-4	Analyzing
10.	Analyze the role of recycling and material recovery in minimizing environmental pollution and conserving natural resources.	16	BT-4	Analyzing
11.	Evaluate the effectiveness of the existing regulatory framework for e-waste management in India and suggest measures for improvement.	16	BT-4	Analyzing
12.	Analyze the importance of integrated e-waste management in achieving sustainable development and circular economy objectives.	16	BT-4	Analyzing
13.	Evaluate the effectiveness of recycling and recovery techniques in reducing the environmental impact of e-waste and improving resource efficiency.	16	BT-5	Evaluate
14.	Critically evaluate the regulatory aspects governing e-waste management and recommend strategies for better implementation.	16	BT-4	Analyzing

15.	Assess the effectiveness of different e-waste collection and transportation systems adopted in urban and rural areas.	16	BT-4	Analyzing
16.	Evaluate integrated e-waste management practices with respect to environmental protection, economic feasibility, and public health.	16	BT-5	Evaluate
17.	Critically examine the role of stakeholders such as manufacturers, consumers, recyclers, and government agencies in achieving effective e-waste management.	16	BT-5	Evaluate
18.	Evaluate the importance of resource recovery from e-waste and justify the need for adopting advanced recycling technologies for sustainable waste management.	16	BT-5	Evaluate