UNIVERSITI
TEKNOLOGI
PETRONAS

FINAL EXAMINATION
JANUARY 2025 SEMESTER

COURSE	**:**	**CCM5263 – ENVIRONMENTAL RISK & IMPACT ASSESSMENT**
DATE	**:**	**12 APRIL 2025 (SATURDAY)**
TIME	**:**	**2:30 PM – 5:30 PM (3 HOURS)**

INSTRUCTIONS TO CANDIDATES

1. This is an **OPEN BOOK** exam.
2. Answer **ALL** questions in the Answer Booklet.
3. Begin **EACH** answer on a new page in the Answer Booklet.
4. Indicate clearly answers that are cancelled, if any.
5. Where applicable, show clearly steps taken in arriving at the solutions and indicate **ALL** assumptions, if any.
6. **DO NOT** open this Question Booklet until instructed.

Note :

i. There are **SIX (6)** printed pages in this **double-sided** Question Booklet including the cover page .

1. The Graniteville train derailment was a catastrophic hazardous materials incident that occurred on January 6, 2005, in Graniteville, South Carolina, USA. The accident involved a Norfolk Southern freight train that collided with a parked train on a sidetrack, causing the rupture of three chlorine tank cars. This resulted in the release of approximately 60 tons of chlorine gas, leading to multiple fatalities, severe health effects, and significant environmental damage. The incident poses serious risks to public health, the environment, and emergency responders. As a hazardous materials response specialist, you are responsible for managing the incident and minimizing its impact.

   Discuss the key hazards associated with the spill and assess their potential effects on human health and the environment. Propose emergency response strategies that should be implemented and suggest preventive measures that could have reduced the likelihood of this spill occurring.

   [24 marks]

2. On January 9, 2014, approximately 10,000 gallons of 4-methylcyclohexane methanol (MCHM), a chemical used in coal processing, leaked from a storage facility owned by Freedom Industries into the Elk River, just 1.5 miles upstream from the water treatment plant supplying water to 300,000 residents. The spill quickly spreads, posing environmental and health risks to nearby communities. As an environmental engineer, you are responsible for developing a comprehensive cleanup strategy by considering:

- Cleanup methods, including physical, chemical, and biological treatments, their advantages and limitations in the context of this spill.
- The most effective approach considering environmental impact, cost, and long-term sustainability.
- Preventive measures to avoid such spills in the future.

[26 marks]

3. A fire has broken out in the hazardous waste collecting area of your facility due to an electrical short circuit, spreading to hazardous waste drums and releasing thick, black smoke. Workers report a strong chemical odour, and investigations identify three hazardous wastes as in **TABLE Q3**.

TABLE Q3: Identified hazards of hazardous wastes

No.	Type of chemical	Hazard	Fire Risk
1	Pesticide Waste (e.g., Organophosphate Residues)	Highly toxic through inhalation, skin absorption, and ingestion. Prolonged exposure may cause respiratory distress, nausea, and neurological impairment.	Decomposes under heat, releasing toxic and flammable phosphorous oxides.
2	Chlorinated Solvent Waste (e.g., Methylene Chloride)	Volatile and carcinogenic. Acute exposure can cause dizziness, respiratory irritation, and unconsciousness.	Non-flammable but produces phosgene gas (a highly toxic respiratory hazard) under high heat.
3	Oxidizing Waste (e.g., Ammonium Nitrate Contaminated Materials)	Strong oxidizer that intensifies combustion and can detonate if exposed to heat or shock.	May cause a secondary explosion, increasing the scale of the emergency and the risk to nearby areas.

While assessing the situation, you receive two critical reports:

1. Two workers in the pesticide waste storage area are experiencing vomiting, headaches, and confusion, suggesting acute pesticide poisoning due to organophosphate residue exposure.
2. The fire has reached the oxidizing waste storage area containing ammonium nitrate-contaminated materials. Hissing sounds from the containers indicate increased internal pressure, posing a risk of a secondary explosion and intensifying the fire.

The facility is near a commercial district and an irrigation canal, raising concerns about environmental contamination. Strong winds could spread toxic smoke to populated areas, increasing public health risks. Immediate action is needed to contain the fire and protect personnel and the surrounding community.

As the safety officer, develop a comprehensive emergency response plan that addresses the following:

- **Incident Handling Techniques**: Steps to suppress the fire, contain chemical leaks, and prevent further chemical reactions.
- **Decontamination and Environmental Protection**: Decontamination procedures for affected personnel and emergency responders and prevention measures to prevent chemical runoff.
- **Site Emergency Management**: Evacuation and shelter-in-place plan for on-site personnel and nearby residents.
- **Risk Mitigation Strategies**: Practical measure to prevent future chemical emergencies and ensure regulatory compliance.

[24 marks]

4. In July 2022, severe floods in Baling, Kedah displaced over 3,000 residents and caused three fatalities. The floods were linked to large-scale land clearing on Gunung Inas for a Musang King durian plantation. This deforestation reduced the area's natural water retention, increasing surface runoff and contributing to the disaster.

Although the Environmental Impact Assessment (EIA) approved in 2013 was for rubber tree cultivation, the land was unauthorizedly converted to durian plantations, raising concerns about EIA non-compliance and regulatory failure to prevent environmental degradation.

As an Environmental Risk & Impact Assessor, you are tasked with evaluating the Gunung Inas durian plantation project. Develop a report addressing the following:

- Key environmental risks posed by the durian plantation and how they could have been mitigated through proper EIA practices and monitoring mechanisms.
- Practical actions to improve EIA compliance and regulatory oversight and how these actions would promote long-term environmental sustainability.
- The responsibilities of project developers and regulatory bodies and strategy to hold both parties accountable for preventing environmental degradation.
- Alternative governance approach, beyond stricter EIA enforcement, to strengthen land-use accountability and prevent similar environmental disasters.

Support your arguments with relevant example(s) and EIA regulation(s).

[26 marks]

-END OF PAPER-