JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2025

B.Tech-VIII Semester

COURSE CODE (CREDITS): 21B1WCE831 (3) MAX. MARKS: 35

COURSE NAME: DISASTER RISK ANALYSIS AND MANAGEMENT

COURSE INSTRUCTORS: DR. SAURAV MAX. TIME: 2 Hour

***Note:*** *(a) All questions are compulsory.*

*(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems*

| Q.No | Question | CO | Marks |
|---|---|---|---|
| Q1 | Explain how Geographic Information Systems (GIS) and Emergency Management Systems (EMS) contribute to all phases of the disaster management cycle. Illustrate their role in enhancing community resilience using suitable examples. | 4 | 6 |
| Q2 | Himachal Pradesh has witnessed an increase in natural disasters like landslides, flash floods, and cloudbursts, particularly during the monsoon season. In a recent event, a landslide in a remote district caused major road blockages, disrupted communication, and delayed rescue operations. In response, the state disaster management authority decided to revise its Emergency Operations Plan (EOP). The new plan incorporates GPS-tracked emergency vehicles, GIS-based hazard zone mapping, and mobile alert systems using SMS and social media platforms to improve disaster preparedness and response.<br>As an engineering graduate specializing in disaster management, analyze the role of an Emergency Operations Plan (EOP) in managing such disasters in Himachal Pradesh. How can the integration of technologies like GPS, GIS, and mobile communication enhance the effectiveness of the EOP in the context of remote, mountainous regions? | 4 | 6 |
| Q3. | Data covering a period of 85 years for a natural hazard flood gives a standard deviation of 1950 units and a mean of 7025 units. Applying Gumbel's method, determine the flood magnitude you would adopt for a project, as a disaster management student, that has a return period of 300 years. If the confidence level for the estimate of the above flood data is 80%, then calculate the confidence limits of the flood magnitude based on the given confidence percentage.<br><br>Given: Sn=1.1850, Yn=0.5702 For 80% confidence, f(c)=1.282 | 3 | 6 |
| Q4. | You are appointed as a disaster risk analyst for a chemical manufacturing plant located in a hazard-prone area. The facility faces significant risk from toxic gas leaks during emergency scenarios such as equipment failure or human error. Using the Fault Tree Analysis (FTA) technique, perform a basic disaster risk analysis to identify the root causes that could lead to a catastrophic toxic gas release. In your answer, clearly: | 3 | 6 |

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| | • Define the top event.<br>• Identify and describe at least three basic contributing events.<br>Draw the Fault Tree diagram showing the logical relationships (AND/OR gates) between events. Also Briefly explain how FTA helps in disaster risk reduction planning and decision-making. | | |
| **Q5.** | As a Disaster Management Expert, if you are allowed to accept only a 5% risk of a natural hazard, such as flooding, over the expected 40-year life of a project, calculate the return period you would adopt for the project's design. Additionally, determine the probability of exactly one flood occurring, exceeding the design capacity, during the 40-year expected lifespan of the project. | **2** | **5** |
| **Q6.** | It is known through data collection and considerable research that the time in minutes that emergency response teams take to arrive at a disaster site, is a random variable with a probability density function:<br>$$f(x) = \begin{cases} \frac{3}{(4)(50^3)}(50^2 - x^2), 0 \le x \le 50 \\ 0 \quad , \quad elsewhere \end{cases}$$<br>a) Find the expected value of the response time in minutes.<br>b) Find $E(X^2)$.<br>c) What is the standard deviation of the response time of emergency teams ? | **1** | **6** |