NAWAB SHAH ALAM KHAN COLLEGE OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

(Name of the Subject/Lab Course):--DISASTER MANAGEMENT

(JNTU CODE: ____RT___) **Programme: UG/PG**

Branch: CIVIL **Version No: 1**

Year: IV **Document Number : NSAKCET/CE/**

Semester: II **No. of Pages:_____**

Classification status (Unrestricted/Restricted) : Distribution List:

Prepared by :	**Updated by :**
1) Name : MD TOUFEEQ	**1) Name :**
2) Sign :	**2) Sign :**
3) Design : _ASSISTANT PROFESSOR_____	**3) Design :**
4) Date :_____	**4) Date :**

Verified by:	***For Q.C only**
1) Name :	**1)Name :**
2) Sign :	**2) Sign :**
3) Design :	**3) Design :**
4) Date :	**4) Date :**

Approved by (HOD) :

1) Name: Syed Farrukh Anwar (Prof.)

2) Sign :

3) Date :

Vision of Institute NSAKCET

To impart quality technical education with strong ethics, producing technically sound engineers capable of serving the society and the nation in a responsible manner.

Mission of Institute NSAKCET

M1: To provide adequate knowledge encompassing strong technical concepts and soft skills thereby inculcating sound ethics.

M2: To provide a conducive environment to nurture creatively in teaching – learning process.

M3: To identify and provides facilities which create opportunities for deserving students of all communities to excel in their chosen fields.

M4: To strive and contribute to the needs of the society and the nation by applying advanced engineering and technical concepts.

1.1 Availability of statements of the Department

Vision of the Civil Engineering Department

To develop technically strong civil engineers having ethics and human values by providing quality education, enabling them to be competent in facing any challenges that may arise during their service in particular to the society and in general to the nation.

Mission of the Civil Engineering Department

M1: To provide conceptually strong technical knowledge relating to all fields of civil engineering braced with professional ethics.

M2: To adopt the latest developments in civil engineering to provide conducive environment for better teaching learning process.

M3: To provide adequate soft skills and make the students prepare for industry ready to grab the opportunities in this field.

M4: To encourage students to participate in various technical events at research institutes, institutes of higher learning so that they develop the capabilities to serve the nation effectively

Program Outcomes

1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO 1: To plan, perform analysis, Design, estimate and execute all kinds of civil Civil engineering projects.

PSO 2: To adopt new innovative technology and use modern techniques so as to execute the Projects within stipulated time.

1.2 PEO's of Civil Engineering Department

PEO1: Graduates will be capable of handling the Civil Engineering projects independently in their future assignments

PEO2: Graduates will be able to apply their technical skills in their chosen fields in an ethical manner.

PEO3: Graduates will be able to implement their core concept to obtain solution for real time problems.

2.SYLLABUS:

DISASTER MANAGEMENT

UNIT – I: Understanding Disaster:Concept of Disaster – Different approaches- Concept of Risk – Levels of Disasters – Disaster Phenomena and Events (Global, national and regional) Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards – Characteristics and damage potential or natural hazards; hazard assessment – Dimensions of vulnerability factors; vulnerability assessment – Vulnerability and disaster risk – Vulnerabilities to flood and earthquake hazards

UNIT – II: Disaster Management Mechanism:Concepts of risk management and crisis managements – Disaster Management Cycle – Response and Recovery – Development, Prevention, Mitigation and Preparedness – Planning for Relief

UNIT – III: Capacity Building:Capacity Building: Concept – Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk – Counter-Disaster Resources and their utility in Disaster Management – Legislative Support at the state and national levels

UNIT – IV: Coping with Disaster:Coping Strategies; alternative adjustment processes – Changing Concepts of disaster management – Industrial Safety Plan; Safety norms and survival kits Mass media and disaster management

UNIT – V: Planning for disaster management:Strategies for disaster management planning – Steps for formulating a disaster risk reduction plan – Disaster management Act and Policy in India – Organizational structure for disaster management in India – Preparation of state and district disaster management plans

6. COURSE OBJECTIVES:

The subject provide different disasters, tools and methods for disaster management

Disasters are happening in this world as a natural phenomenon or as anthropogenic activities.

Organizations and agencies involved in Disaster Management find it necessary to recruit professionals having specific skills and knowledge, who can contribute to a more holistic understanding of the development, vulnerability and mitigation of disasters. These professionals should be involved in conceptual work, evaluation studies and in the prediction of disasters scientifically. Engineering Education is supposed to educate the budding Engineers, to solve the real and complex problems faced by the world, to have a successful career at their place of work and also in their life. A modified curriculum has to be formulated including Disaster Management as a core paper for engineering students rather than an Elective paper as in some Indian Universities. All Engineering fields are prone to some sort of hazard. Depending on the nature of this hazard, Disaster management component may be included in each and every subject so that the student will be able to understand the practical aspect of the subject better.

Course Outcomes:

At the end of the course, the student will be able to:

- Understanding Disasters, man-made Hazards and Vulnerabilities
- Understanding disaster management mechanism
- Understanding capacity building concepts and planning of disaster managements

Program Outcomes

1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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Department of Civil Engineering

Course Outcomes & CO-PO Mapping

Course Name: DISASTER MANAGEMENT **AY:** 2020-21

Course Code: **Semester:** VIII

Name of the faculty member: Mohd Toufeeq

Course Outcomes

After completing this course the student will be able to:

CO No.	Course Outcome	Taxonomy Level
CO1	**Understanding** Disasters, man-made Hazards and Vulnerabilities.	L2.Understanding
CO2	**Understanding** disaster management mechanism.	L2.Understanding
CO3	**Understanding** capacity building concepts and planning of disaster managements	L2.Understanding
CO4	**Applying** Concepts of disaster management Safety Plan like Safety norms and survival kits etc.	L3. Applying
PSO 1	**To plan** the building and perform analysis, design, estimation and execute all kinds of civil Engineering Projects.	L4.Applying/ L6.Creating
PSO 2	**To adopt** new innovative technology and use modern techniques, so as to execute the project within the stipulated time.	L6.Creating

CO-PO Mapping before gaps:

PO / CO	P O1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS0 1	PSO 2
CO.1	1	1	-	-	-	-	-	-	-	-	-	-	1	1
CO.2	-	-	2	-	-	-	-	-	-	-	-	-	1	1
CO.3	1	1		-	1	-	-	-	-	-	-	-	2	2
CO.4			2	1	-	-	-	-	-	-	-	-	2	-
Avg	0.5	0.5	1	0.25	0.25	-	-	-	-	-	-	-	1.5	1

Signature of Faculty **Head of Department**

DISASTER MANAGEMENT A.Y:2020-21

CO-PO/PSO Mapping Justification

CO1: **Understanding** Disasters, man-made Hazards and Vulnerabilities.

L2.Understanding

	Mapping Level	Justification
PO1	1	Students Requires basic knowledge of Concept of Disaster.
PO2	1	Identifying Dimensions of vulnerability factors and disaster risk.
PSO1	1	Concepts of risk management and crisis managements,Response and Recovery,Development, Prevention, Mitigation and Preparedness,Planning for Relief.
PSO2	1	Capacity Building Concept i.e,Structural and Nonstructural Measures Capacity Assessment,Strengthening Capacity for Reducing Risk.

CO2 : **Understanding** disaster management mechanism. **(L2. Understanding)**

	Mapping Level	Justification
PO3	2	Concepts of risk management and crisis managements.
PSO1	1	Strengthening Capacity for Reducing Risk,Counter Disaster Resources and their utility in Disaster Management.
PSO2	1	Coping Strategies alternative adjustment processes Changing Concepts of disaster management.

CO3: **Understanding** capacity building concepts and planning of disaster managements. **(L2.Understanding)**

	Mapping Level	Justification
PO1	1	Able to apply the knowledge & Coping Strategies alternative adjustment processes Changing Concepts of disaster management.
PO5	1	Safety norms and survival kits Mass media and disaster management.
PSO1	2	Analyze Concept of Disaster Different approaches Concept of Risk, Levels of Disasters,(Global, national and regional).
PSO2	2	Adopt latest technology to cope up with disaster i.e, Response and Recovery Development, Prevention, Mitigation and Preparedness,Planning for Relief.

CO4: **Applying** Concepts of disaster management Safety Plan like Safety norms and survival kits etc. **L3. Applying**

	Mapping Level	Justification
PO3	2	Understanding Concepts of disaster management such as Industrial Safety Plan,Safety norms and survival kits,Mass media and disaster management.
PO4	1	Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan.
PO1	2	Executing the disaster risk reduction plan and safety precaution.

Faculty sign **HOD**

PREREQUISITE(S):

Level	Credits	Periods/ Week	Prerequisites
UG	3	4	1) ENVIRONMENTAL ENGG.

NAWAB SHAH ALAM KHAN COLLEGE OF ENGINEERING & TECHNOLOGY								
NEW MALAKPET, HYDERABAD - 500024.								
TIME TABLE FOR B.TECH IV YEAR II SEMESTER 2020 - 2021 (ONLINE/OFFLINE MODE)								
DEPARTMENT OF CIVIL ENGINEERING								wef:31-8-2020
Branch	Civil IV-A							
Days	9:30 TO 10:20	10:20 TO 11:10	11:10 TO 12:00	12:00 TO 12:50	12:50 TO 1:30	1:30 TO 2:20	2:20 TO 3:10	3:10 TO 4:00
MON	IWWT		WM		L B U R N E C A H K	DM		TUTORIALS
TUE	IWWT		WM			DM		TUTORIALS
WED	PROJECT					SEMINAR		
THUR	PROJECT					SEMINAR		
FRI	PROJECT					SEMINAR		

THEORY:

IWWT : MS SHAMEEM
WM : MR RIYAN
DM : MR MAAZ
PROJECT WORK : MR ZAKER & MR RIYAN
SEMINAR WORK : MR. HUZAIFA & MR YOUSUF

HOD

HEAD
Department of Civil Engineering
NAWAB SHAH ALAM KHAN COLLEGE
OF ENGINEERING & TECHNOLOGY
16-4-1/A, New Malakpet, Hyderabad - 500 024.

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OF ENGINEERING & TECHNOLOGY
16-4-1/A, New Malakpet, Hyderabad-500024
College Code:1610

NAWAB SHAH ALAM KHAN COLLEGE OF ENGINEERING & TECHNOLOGY							
NEW MALAKPET, HYDERABAD - 500024.							
TIME TABLE FOR B.TECH IV YEAR II SEMESTER 2020 - 2021 (ONLINE/OFFLINE MODE)							
DEPARTMENT OF CIVIL ENGINEERING							wef:31-8-2020
Branch	Civil IV-B						
Days	9:30 TO 10:20	10:20 TO 11:10	11:10 TO 12:00	12:00 TO 12:50	12:50 TO 1:40	1:40 TO 2:30	2:30 TO 3:20	3:20 TO 4:10
MON	WM		IWWT		L B U R N E C A H K	PROJECT		
TUE	WM		IWWT			SEMINAR		
WED	DM		DM			SEMINAR		
THUR	PROJECT					SEMINAR		
FRI	PROJECT					TUTORIALS		

THEORY:

IWWT : MR MOULALI
WM : MR NOOR
DM : MR TAGORE
PROJECT WORK : MR. SHAKEEB & MR. SHAZEB
SEMINAR WORK : MR. JAVID & MR. AQUIL

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NAWAB SHAH ALAM KHAN COLLEGE
OF ENGINEERING & TECHNOLOGY
16-4-1/A, New Malakpet, Hyderabad - 500 024.

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NAWAB SHAH ALAM KHAN COLLEGE
OF ENGINEERING & TECHNOLOGY
16-4-1/A, New Malakpet, Hyderabad-500024
Online Code:1510

NAWAB SHAH ALAM KHAN COLLEGE OF ENGINEERING & TECHNOLOGY								
NEW MALAKPET, HYDERABAD - 500024.								
TIME TABLE FOR B.TECH IV YEAR II SEMESTER 2020 - 2021 (ONLINE/OFFLINE MODE)								
DEPARTMENT OF CIVIL ENGINEERING								wef:31-8-2020
Branch	Civil IV-C							
Days	9:30 TO 10:20	10:20 TO 11:10	11:10 TO 12:00	12:00 TO 12:50	12:50 TO 1:40	1:40 TO 2:30	2:30 TO 3:20	3:20 TO 4:10
MON	DM		WM		LUNCH BREAK	IWWT		TUTORIALS
TUE	DM		PROJECT			WM		TUTORIALS
WED	IWWT		SEMINAR			SEMINAR		
THUR	PROJECT					SEMINAR		
FRI	PROJECT					TUTORIALS		

THEORY:

IWWT : MR MUZAMIL
WM : MS MOHAMMEDI
DM : MR SALMAN
PROJECT WORK : MR. FIRASATH & MR MOULALI
SEMINAR WORK : MR. MUZAMIL & MR. NOOR

HOD

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16-4-1/A, New Malakpet, Hyderabad - 500 024.

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OF ENGINEERING & TECHNOLOGY
16-4-1/A, New Malakpet, Hyderabad-500024
College Code:1610

MOHD SALMAN								
Day / Period	1	2	3	4		5	6	7
MON	DM				L U N C H			
TUE	DM							
WED								
THU								
FRI								
SAT								

Nawab Shah Alam Khan College of Engineering & Technology

Department of Civil Engineering Lesson Plan & Schedule

Year & Sem: IV year Sem-2

Sub:DISASTER MANAGEMENT

Faculty Name: Mohd.Toufeeq

S. No.	Topic to be Covered	Total No. of Periods
	UNIT-1	
	Introduction	**6**
1	Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters..	1
2	Disaster Phenomena and Events (Global, national and regional).	1
3	Natural and man-made hazards; response time, frequency and forewarning levels of different hazards.	3
4	Dimensions of vulnerability factors; vulnerability assessment -Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards .	1
		6

	UNIT-II	
5	Concepts of risk management and crisis managements.	2
6	Disaster Management Cycle - Response and Recovery..	2
7	Development, Prevention, Mitigation and Preparedness - Planning for Relief	2
	UNIT III	**8**
8	Capacity Building: Concept - Structural and Nonstructural Measures.	2
9	Capacity Assessment; Strengthening Capacity for Reducing Risk..	3
10	Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels.	3
	UNIT IV	**7**
11	Coping Strategies; alternative adjustment processes Changing Concepts of disaster management.	3
12	Industrial Safety Plan; Safety norms and survival kits. Mass media and disaster management.	4
	UNIT V	**7**
13	Strategies for disaster management planning.	4
14	Steps for formulating a disaster risk reduction plan Disaster management Act and Policy in India.	3
	Total number of weeks	12
	Total number of periods	**34**

Lesson schedule

Nawab Shah Alam Khan College of Engineering & Technology

Department of Civil Engineering

Lesson plan (2020-2021)

YEAR: IV , SEM: II

SUBJECT: DISASATER MANAGEMENT

Section:

FACULTY NAME: MR.MD.TOUFEEQ

S.NO	Topics to be covered	Total No. of Peridos	DATES
	UNIT 1		
1	Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters.	2	22-03-2021
2	Disaster Phenomena and Events (Global, national and regional)	1	23-03-2021
3	Natural and man-made hazards; response time, frequency and forewarning levels of different hazards.	2	30-03-2021
4	Dimensions of vulnerability factors; vulnerability assessment -	1	05-04-2021
5	Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards	2	06-04-2021 12-04-2021

	UNIT 2		
8	Concepts of risk management and crisis managements -	1	13-04-2021
9	Disaster Management Cycle - Response and Recovery.	2	19-04-2021
10	Development, Prevention, Mitigation and Preparedness - Planning for Relief	2	20-04-2021

	UNIT-3		
12	Capacity Building: Concept - Structural and Nonstructural Measures.	2	26-04-2021
13	Capacity Assessment; Strengthening Capacity for Reducing Risk.	2	27-04-2021
14	Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels	2	03-05-2021
	UNIT-4		
15	Coping Strategies; alternative adjustment processes Changing Concepts of disaster management	2	04-05-2021
16	Industrial Safety Plan; Safety norms and survival kits.	2	17-05-2021
17	Mass media and disaster management.	2	17-05-2021

	UNIT-5		
21	Strategies for disaster management planning.	1	24-05-2021
22	Steps for formulating a disaster risk reduction plan.	2	07-05-2021
23	Disaster management Act and Policy in India.	3	14-05-2021

8. Brief notes on the importance of the course and how it fits into the curriculum

UNIT-1

Environmental hazard' is the state of events which has the potential to threaten the surrounding natural environment and adversely affect people's health. This term incorporates topics like pollution and natural disasters such as storms and earthquakes. Hazards can be categorized in five types:

1.Chemical
2.Physical
3.Mechanica
4.Biological
5. Psychosocial

What are chemical hazards and toxic substances?

Chemical hazards and toxic substances pose a wide range of health hazards (such as irritation, sensitization, and carcinogenicity) and physical hazards (such as flammability, corrosion, and reactivity).

This page provides basic information about chemical hazards and toxic substances in the workplace. While not all hazards associated with every chemical and toxic substance are addressed here, we do provide relevant links to other pages with additional information about hazards and methods to control exposure in the workplace.

A **natural disaster** is a major adverse event resulting from natural processes of the Earth; examples include floods, volcanic eruptions, earthquakes, tsunamis, and other geologic processes. A natural disaster can cause loss of life or property damage, and typically leaves some economic damage in its wake, the severity of which depends on the affected population's resilience, or ability to recover. An adverse event will not rise to the level of a disaster if it occurs in an area without vulnerable population. In a vulnerable area, however, such as San Francisco, an earthquake can have disastrous consequences and leave lasting damage, requiring years to repair.

In 2012, there were 905 natural catastrophes worldwide, 93% of which were weather-related disasters. Overall costs were US$170 billion and insured losses $70 billion. 2012 was a moderate year. 45% were meteorological (storms), 36% were hydrological (floods), 12% were climatologically (heat waves, cold waves, droughts, wildfires) and 7% were geophysical events (earthquakes and volcanic eruptions). Between 1980 and 2011 geophysical events accounted for 14% of all natural Avalanches

water covers land used by man like a village, city or other inhabited area, roads, expanses of farmland, etc.

Limnic eruptions

A cow suffocated by gases from Lake Nyosafter a limnic eruption

A limnic eruption occurs when a gas, usually CO_2, suddenly erupts from deep lake water, posing the threat of suffocating wildlife, livestock and humans. Such an eruption may also cause tsunamis in the lake as the rising gas displaces water. Scientists believe landslides,volcanic activity, or explosions can trigger such an eruption. To date, only two limnic eruptions have been observed and recorded:

Tsunami

Tsunamis can be caused by undersea earthquakes as the one caused by the 2004 Indian Ocean Earthquake, or by landslides such as the one which occurred at Lituya Bay, Alaska.

- The 2004 Indian Ocean Earthquake created the Boxing Day Tsunami.
- On March 11, 2011, a tsunami occurred near Fukushima, Japan and spread through the Pacific.

IT CAN widespread destruction and consequent disaster in several ways. The effects include the volcanic eruption itself that may cause harm following the explosion of the volcano or the fall of rock. Second, lava may be produced during the eruption of a volcano. As it leaves the volcano, the lava destroys many buildings and plants it encounters. Third, volcanic ash generally meaning the cooled ash - may form a cloud, and settle thickly in nearby locations. When mixed with water this forms a concrete-like material. In sufficient quantity ash may cause roofs to collapse under its weight but even small quantities will harm humans if inhaled. Since the ash has the consistency of ground glass it causes abrasion damage to moving parts such as engines. The main killer of humans in the immediate surroundings of a volcanic eruption is the pyroclastic flows, which consist of a cloud of hot volcanic ash which builds up in the air above the volcano and rushes down the slopes when the eruption no longer supports the lifting of the gases. It is believed that Pompeii was destroyed by a pyroclastic flow. A lahar is a volcanic mudflow or landslide. The 1953 Tangiwai disaster was caused by a lahar, as was the 1985 Armero tragedy in which the town of Armero was buried and an estimated 23,000 people were killed .

Hailstorms

Hailstorms are falls of rain drops that arrive as ice, rather than melting before they hit the ground. A particularly damaging hailstorm hit Munich, Germany, on July 12, 1984, causing about 2 billion dollars in insurance claims.

Heat waves

A heat wave is a period of unusually and excessively hot weather. The worst heat wave in recent history was the European Heat Wave of 2003.

A summer heat wave in Victoria, Australia, created conditions which fuelled the massive bushfires in 2009. Melbourne experienced three days in a row of temperatures exceeding 40°C (104°F) with some regional areas sweltering through much higher temperatures. The bushfires, collectively known as "Black Saturday", were partly the act of arsonists.

The 2010 Northern Hemisphere summer resulted in severe heat waves, which killed over 2,000 people. It resulted in hundreds of wildfires which causing widespread air pollution, and burned thousands of square miles of forest.

Heat waves can occur in the ocean as well as on land with significant effects (often on a large scale) e.g. coral bleaching.

Tornadoes

An exceptionally clearly developed single-cell Cumulonimbus incus Big displaying the classic anvil shape; associated gusts may occur from the direct proximity to several times the height of the cloud.

A tornado is a violent, dangerous, rotating column of air that is in contact with both the
surface of the earth and a cumulonimbus cloud or, in rare cases, the base of cumulus. It is also referred to as a *twister* or a *cyclone*,[12] although the word cyclone is used in meteorology in a wider sense, to refer to any closed pressure circulation. Tornadoes come in many shapes and sizes, but are typically in the form of a visible condensation funnel, whose narrow end touches the earth and is often encircled by a cloud of debris and dust. Most tornadoes have wind speeds less than 110 miles per hour (177 km/h), are approximately 250 feet (80 m) across, and travel a few miles (several kilometers) before dissipating. The most extreme tornadoes can attain wind speeds of more than 300 mph (480 km/h), stretch more than two miles (3 km) across, and stay on the ground for dozens of miles (perhaps more than 100 km).

Well-known historical tornadoes include:

- The Tri-State Tornado of 1925, which killed over 600 people in the United States;
- The Daulatpur-Saturia Tornado of 1989, which killed roughly 1,300 people in Bangladesh.

UNIT-2

A **natural disaster** is a major adverse event resulting from natural processes of the Earth; examples include floods, volcanic eruptions, earthquakes, tsunamis, and other geologic processes. A natural disaster can cause loss of life or property damage, and typically leaves some economic damage in its wake, the severity of which depends on the affected population's resilience, or ability to recover.

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Avalanches

During World War I, an estimated 40,000 to 80,000 soldiers died as a result of avalanches during the mountain campaign in the Alps at the Austrian-Italian front, many of which were caused by artillery fire.

Earthquakes

An **earthquake** is the result of a sudden release of energy in the Earth's crust that creates seismic waves. At the Earth's surface, earthquakes manifest themselves by vibration, shaking and sometimes displacement of the ground. The vibrations may vary in magnitude. Earthquakes are caused mostly by slippage within geological faults, but also by other events such as volcanic activity, landslides, mine blasts, and nuclear tests. The underground point of origin of the earthquake is called the *focus*. The point directly above the focus on the surface is called the *epicenter*. Earthquakes by themselves rarely kill people or wildlife. It is usually the secondary events that they trigger, such as building collapse, fires, tsunamis (seismic sea)

Volcanic eruptions

Volcanoes can cause widespread destruction and consequent disaster in several ways. The effects include the volcanic eruption itself that may cause harm following the explosion of the volcano or the fall of rock. Second, lava may be produced during the eruption of a volcano. As it leaves the volcano, the lava destroys many buildings and plants it encounters. Third, volcanic ash generally meaning the cooled ash - may form a cloud, and settle thickly in nearby locations. When mixed with water this forms a

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- On March 11, 2011, a tsunami occurred near Fukushima, Japan and spread through the Pacific.

Tropical Cyclones

Cyclone, tropical cyclone, hurricane, and *typhoon* are different names for the same phenomenon a cyclonic storm system that forms over the oceans. The deadliest hurricane ever was the 1970 Bhola cyclone; the deadliest Atlantic hurricane was theGreat Hurricane of 1780 which devastated Martinique, St. Eustatius and Barbados. Another notable hurricane is Hurricane Katrina which devastated the Gulf Coast of the United States in 2005.

Extra tropical Cyclones

Extratropical cyclones, sometimes called mid-latitude cyclones, are a group of cyclones defined as synoptic scale low pressure weather systems that occur in the middle latitudes of the Earth (outside the tropics) not having tropical characteristics, and are connected with fronts and horizontal gradients in temperature and dew point otherwise known as "baroclinic zones". As with tropical cyclones, they are known by different names in different regions (Nor'easter, Pacific Northwest windstorms, European windstorm, East Asian-northwest Pacific storms, Sudestada andAustralian east coast cyclones). The most intense extratropical cyclones cause widespread disruption and damage to society, such as the storm surge of the North Sea flood of 1953 which killed 2251 people in the Netherlands and eastern England, the Great Storm of 1987 which devastated southern England and France and the Columbus Day Storm of 1962which struck the Pacific Northwest.

Droughts

Drought is unusual dryness of soil, resulting in crop failure and shortage of water for other uses, caused by significantly lower rainfall than average over a prolonged period. Hot dry winds, high temperatures and consequent evaporation of moisture from the ground can contribute to conditions of drought.

Well-known historical droughts include:

- 1900 India killing between 250,000 to 3.25 million.

Anthropogenic hazards or **human-made hazards** can result in the form of a **human-made disaster**. In this case,*anthropogenic* means threats having an element of human intent, negligence, or error; or involving a failure of a human-made system. This is as opposed to natural hazards that cause natural disasters. Either can result in huge losses of life and property as well as damage to peoples' mental, physical and social well-being.

Sociological hazards

Crime is a breach of the law for which some governing authority (via the legal systems) can

ultimately prescribe a convictionwhich will carry some form of penalty, such as imprisonment or a fine. At least in the view of the legislators, the criminal act will cause harm to other people. Each legal jurisdiction may define crime differently. While every crime violates the law, not every violation of the law counts as a crime: for example, breaches of contract and of other private law may rank as "offenses" or as "infractions". Modern societies generally regard crimes as offenses against the public or the state, distinguished from torts (offenses against private parties that can give rise to a civil cause of action).

A cow suffocated by gases from Lake Nyosafter a limnic eruption

A limnic eruption occurs when a gas, usually CO_2, suddenly erupts from deep lake water, posing the threat of suffocating wildlife, livestock and humans. Such an eruption may also cause tsunamis in the lake as the rising gas displaces water. Scientists believe landslides,volcanic activity, or explosions can trigger such an eruption. To date, only two limnic eruptions have been observed and recorded:

Leading to business losses and medical emergencies. Extended loss of power can lead to civil disorder, as in the New York City blackout of 1977. Only very rarely do power outages escalate to disaster proportions, however, they often accompany other types of disasters, such as hurricanes and floods, which hampers relief efforts.

Electromagnetic pulses and voltage spikes from whatever cause can also damage electricity Bush fires, forest fires, and mine fires are generally started by lightning, but also by human negligence or arson. They can burn thousands of square kilometers. If a fire intensifies enough to produce its own winds and "weather", it will form into afirestorm. A good example of a mine fire is the one near Centralia, Pennsylvania. Started in 1962, it ruined the town and continues to burn today. Some of the biggest city-related fires are The Great Chicago Fire,

The Peshtigo Fire (both of 1871) and the Great Fire of London in 1666.

Casualties resulting from fires, regardless of their source or initial cause, can be aggravated by inadequate emergency preparedness. Such hazards as a lack of accessible emergency exits, poorly marked escape routes, or improperly maintained fire extinguishers or sprinkler systems may result in many more deaths and injuries than might occur with such protections.

(Part 1) 2002] assigns four levels of seismicity for India in terms of zone factors. In other words, the earthquake zoning map of

India divides India into 4 seismic zones (Zone 2, 3, 4 and 5) unlike its previous version which consisted of five or six zones for the country. According to the present zoning map, Zone 5 expects the highest level of seismicity whereas Zone 2 is associated with the lowest level of

seismicity. The latest seismic zoning map can be accessed from The India Meteorological Department website.

The MSK (Medvedev-Sponheuer-Karnik) intensity broadly associated with the various seismic zones is VI (or less), VII, VIII and IX (and above) for Zones 2, 3, 4 and 5, respectively, corresponding to Maximum Considered Earthquake (MCE). The IS code follows a dual design philosophy: (a) under low probability or extreme earthquake events (MCE) the structure damage should not result in total collapse, and (b) under more frequently occurring earthquake events, the structure should suffer only minor or moderate structural damage. The specifications given in the design code (IS 1893: 2002) are not based on detailed assessment of maximum ground acceleration in each zone using a deterministic or probabilistic approach. Instead, each zone factor represents the effective period peak ground accelerations that may be generated during the **maximum considered earthquake** ground motion in that zone.

Each zone indicates the effects of an earthquake at a particular place based on the

observations of the affected areas and can also be described using a descriptive scale like Modified Mercalli intensity scale[3] or the Medvedev-Sponheuer-Karnik

EARTHQUAKE HAZARD ZONATION, RISK EVALUATION AND MITIGATION The importance of seismological studies lies in the fact that information generated can be used to mitigate the earthquake hazards. Preparation of seismotectonic/seismic zonation maps is the first step in this direction. The basic data required for the preparation of these maps are (i) A carefully compiled earthquake catalogue incorporating details about magnitude, location of epicenter, depth of focus *etc.*, (ii) Delineation of seismic source zones from all possible sources like recurrence relation, tectono-geological consideration, palaeoseismicity *etc.*, (iii) Estimation of upper bound magnitude through statistical procedure, cumulative seismic energy release, active fault length *etc.* and (iv) Attenuation of ground shaking for better results (Das Gupta, 1999). Seismic microzonation is recommended for better result. These maps give an idea about the possibility of occurrence of earthquakes in the region and are very useful for evaluating the risk involved before designing and constructing the heavy engineering structures like dam, bridges, flyovers and large towers *etc.* These are also useful for planning human settlements that would remain safe during the occurrence of an earthquake. Seismic risk evaluation is also possible from these maps.

Indian Meteorological Department, National Geophysical Research Institute, Department of Science & Technology, Bhabha Atomic Research Centre and Regional Research Laboratory have established a large number of seismic monitoring network in the country including northeastern region. These stations are recording useful seismic data, which enables to determine the location of epicenter, useful seismic data which enables to determine the location of epicenter, depth of hypocenter, energy within the focus, orientation of the geological structure that has undergone deformation and many other parameters of earthquakes. These parameters are then utilised for preparing seismo-tectonic and seismic zoning maps. The work in seismic zoning in India was started by Indian Standard Institute (now Bureau of Indian Standard) in the year 1960 and the first map was included in the code IS: 1893-1962. A significant progress has been made since then both in seismic zoning and instrumental monitoring of seismicity.

There are three different types of eruptions. The most well-observed are magmatic eruptions, which involve the decompression of gas within magma that propels it forward. Phreatomagmatic eruptions are another type of volcanic eruption, driven by the compression of gas within magma, the direct opposite of the process powering magmatic activity. The third eruptive type is the phreatic eruption, which is driven by the superheating of steam contact with magma; these eruptive types often exhibit no magmatic release, instead causing the granulation of existing rock.

Within these wide-defining eruptive types are several subtypes. The weakest are Hawaiian and submarine, then Strombolian, followed by Vulcanian and Surtseyan. The stronger eruptive types are Pelean eruptions, followed by Plinian eruptions; the strongest eruptions are called "Ultra Plinian." Subglacial and phreatic eruptions are defined by their eruptive mechanism, and vary in strength. An important measure of eruptive strength is Volcanic Explosivity Index (VEI), an order of magnitude scale ranging from 0 to 8 that often correlates to eruptive types.

Harmful effects o volcanic erruptions

Volcanoes affect people in many ways, some are good, some are not. Some of the bad ways are that houses, buildings, roads, and fields can get covered with *ash*. As long as you can get the ash off (especially if it is wet), your house may not collapse, but often the people leave because of the ash and are not around to continually clean off their roofs. If the *ashfall* is really heavy it can make it impossible to breathe.

Lava flows are almost always too slow to run over people, but they can certainly run over houses, roads, and any other structures.

Pyroclastic flows are mixtures of hot gas and ash, and they travel very quickly down the slopes of volcanoes. They are so hot and choking that if you are caught in one it will kill you. They are also so fast (100-200 km/hour) that you cannot out-run them. If a volcano that is known for producing pyroclastic flows is looking like it may erupt soon, the best thing is for you to leave before it does.

Some of the good ways that volcanoes affect people include producing spectacular scenery, and producing very rich soils for farming.

Gases

Water vapor, the most common gas released by volcanoes, causes few problems. Sulfur dioxide, carbon dioxide and hydrogen are released in smaller amounts. Carbon monoxide, hydrogen sulfide, and hydrogen fluoride are also released but typically less than 1 percent by volume.Gases pose the greatest hazard close to the *vent* where concentrations are greatest. Away from the vent the gases quickly become diluted by air. For most people even a brief visit to a

which is 25 km from the volcano! A 7 cm pumice won't necessarily kill you but it does mean that there is a lot of pumice falling, and if you don't get out and continuously sweep off your roof it may fall in and you'll get squashed.On the other hand, the current eruption at Ruapehu is relatively small. In fact, there were skiers up on the slopes when the eruptions commenced, and even though they were only 1-2 km from the vent they managed to escape. The volcanologists routinely go up on the higher slopes of Ruapehu during these ongoing eruptions to collect ash and take photographs.

So you see, you need to know something about what you think the volcano is going to do before you decide how far to run away. I guess if you have no idea of what the volcano is planning, and have no idea of what it has done in the past, you might want to be at least 25-30 km away, make sure you have a good escape route to get even farther away if necessary, and by all means stay out of low-lying areas!

Cities and Towns

The effect an eruption will have on a nearby city could vary from none at all to catastrophic. For example, atmospheric conditions might carry ash away from the city or topography might direct lahars and pyroclastic flows to unpopulated areas. In contrast, under certain atmospheric, eruption and/or topographic conditions, lahars, pyroclastic flows, and/or ash fall could enter the city causing death and destruction.

This scenario brings up several interesting problems. How do you evacuate a large population if there is little warning before the eruption? Where do these people go? If an eruption is highly likely yet hasn't happened yet how long can people be kept away from their homes and businesses?

I should point out that in most volcanic crises geologists advise local civil defense authorities. The civil defense authorities decide what to do concerning evacuations, etc.

The IAVCEI has a program to promote research on "Decade" Volcanoes. Decade volcanoes are likely to erupt in the near future and are near large population centers. Mount Rainier in Washington and Mauna Loa in Hawaii are two Decade volcanoes in the U.S. Other Decade volcanoes include Santa Maria, Stromboli, Pinatubo, and Unzen.

What happens to the towns around a volcano when it erupts depends on many things. It depends of the size and type of eruption and the size and location of the town. A few examples might help. The 1984 eruption of Mauna Loa in Hawaii sent lava towards Hilo but the eruption stopped before the flows

- Around Pacific Ocean
- Along the Indo-Australian pate boundary
- Eastern side of Eurasian plate
- Western side of North American plate

Volcanoes and earthquakes are both found on plate boundaries. However, there is a difference between the two since volcanoes are never found on conservative and divergent boundaries because there is no change in crust to allow more magma (molten rock) to be made.

UNIT-4

ATMOSPHERIC HAZARDS

Common types of toxic gases encountered in confined spaces are:

- *Hydrogen Sulfide* - "sewer gas" a colorless gas with the odor of rotten eggs. Excessive exposure has been linked to many confined space deaths. Hydrogen sulfide causes a loss of our sense of smell, causing people to mistakenly think that the gas has left the space. Hydrogen sulfide inhibits the exchange of oxygen on the cellular level and causes asphyxiation.
- *Carbon monoxide* - is an odorless, colorless gas that is formed by burning carbon based fuels (gas, wood). Carbon monoxide inhibits the bodies ability to transport oxygen to all parts of the body.
- *Solvents* - many solvents, such as kerosene, gasoline, paint strippers, degreasers, etc. are not only flammable, but if inhaled at high concentrations can cause central nervous system (CNS) effects. CNS effect can include dizziness, drowsiness, lack of concentration, confusion, headaches, coma and death.

Causes of tropical cyclone

A cyclone is formed over tropical seas. Winds from opposite directions meet. This air is heated by the warm seas and so evaporates moisture from the ocean. This warm air rises up rapidly, cools and condenses to form clouds and produces an area of very low pressure. When moisture and air mix, it makes a collection of thunderstorms from which a cyclone can develop. Water needs to be at least 26 degrees warm so a tropical cyclone can develop. More air is sucked in to take its place, and it too is heated and rises rapidly. This sucking in and risins movement of the air produces spiralling clouds. Eventually, an enormous storm system is built up, which can spread over two hundred kilometres. Heavy rain falls from the clouds. There is much thunder and lightning and the fast winds whip up the waves of the ocean. In the middle of this system, air moves down. This produces a patch of drier, calm weather with few clouds. It is called the 'eye' of the storm and can last for an hour before the fierce winds and torrential rainstorms sweep in again. When the cyclone hits land, it soon weakens as there is no warm, moist air to 'feed' the storm.

A **chemical accident** is the unintentional refuse of one or more hazardous substances which could harm human health or the environment. **Chemical hazards** are systems where chemical accidents could occur under certain circumstances. Such events include fires, explosions,

that can assist with substance risk assessment and emergency planning that is required by a wide variety of legislation, such as the National Chemical Emergency Centre in the UK.

Brandweer informative centrum voor gevaar lijke stoffen/Fire service information centre for dangerous goods in Belgium.

In the UK, the UK Chemical Reaction Hazards Forum publishes reports of accidents on its web site.[2] These accidents were, at the time in nature, but they could have escalated into major accidents. It is Joped that publishing these incidents will prevent "Re-inventing the Wheel". At present, (Dec 2008), there are over 140 articles on the web site.

A **nuclear explosion** is an explosion that occurs as a result of the rapid release of energy from a high-speed nuclear reaction. The driving reaction may be nuclear fission, nuclear fusion or a multistage cascading combination of the two, though to date all fusion based weapons have used a fission device to initiate fusion, and a pure fusion weapon remains a hypothetical device.

Atmospheric nuclear explosions are associated with mushroom clouds, although mushroom clouds can occur with large chemical explosions, and it is possible to have an air-burst nuclear explosion without these clouds. Nuclear explosions produce radiation and radioactive debris.

Sedimentation is the tendency for particles in suspension to settle out of the fluid in which they are entrained, and come to rest against a barrier. This is due to their motion through the fluid in response to the forces acting on them: these forces can be due to gravity, centrifugal acceleration or electromagnetism. In geology sedimentation is often used as the polar opposite of erosion, i.e., the terminal end of sediment transport. In that sense it includes the termination of transport by saltation or true bedload transport. Settling is the falling of suspended particles through the liquid, whereas sedimentation is the termination of the settling process. Sedimentation may pertain to objects of various sizes, ranging from large

reader is referred to Roose (FAO, 1994a) for a detailed analysis of the social, economic and physical consequences of erosion of agricultural land and of measures that should be taken to control erosion under different types of land use, especially in developing countries. Whereas Roose is mainly concerned with the impact of erosion on agriculture, this publication is primarily concerned with agricultural erosion from the perspective of its impacts on downstream water quality.

Control of agricultural pollution usually begins, therefore, with measures to control erosion and sediment runoff. Therefore, this chapter deals with the principal mechanisms which govern erosion processes, and those measures which can be taken to control erosion. Processes discussed here also apply to fertilizer and pesticide runoff presented in the following chapters.

Sediment as a physical pollutant

Global estimates of erosion and sediment transport in major rivers of the world vary widely, reflecting the difficulty in obtaining reliable values for sediment concentration and discharge in many countries, the assumptions that are made by different researchers, and the opposing effects of accelerated erosion due to human activities (deforestation, poor agricultural practices, road construction, etc.) relative to sediment storage by dam construction. Milliman and Syvitski (1992) estimate global sediment load to oceans in the mid-20th century at 20 thousand million t/yr, of which about 30% comes from rivers of southern Asia (including the Yangtze and Yellow Rivers of China). Significantly, they believe that almost 50% of the global total comes from erosion associated with high relief on islands of Oceania - a phenomenon which has been underestimated in previous estimates of global sediment production. While erosion on mountainous islands and in upland areas of continental rivers reflects natural topographic influences, Milliman and Syvitski suggest that human influences in

largely originates from rapidly eroding sub-basins due to poor agricultural practices.

Why Regional Sediment Management?

Sediment is an essential and dynamic part of the Harbor Estuary; its quality and quantity are integral to ecosystem health and a fundamental component of the regional economy. Although sediment and the pollutants that contaminate it originate throughout the 16,300-square mile watershed, our management of sediment has historically taken a highly localized and narrowly focused approach – one that is largely based on the tightly-defined concerns of agencies and authorities directly responsible for maintaining navigable waterways in the Harbor Estuary. This "end of the pipe" management approach does not address the causes of sediment-related problems, nor does it provide the policy and regulatory framework required to improve sediment management throughout the Harbor Estuary. Uncertainties and controversy have stalled sediment
cleanup and restoration projects, deferred maintenance of our port infrastructure, and led to lost opportunities to beneficially reusing dredged material.

Coastal Hazards are physical phenomena that expose a coastal area to risk of property damage, loss of life and environmental degradation. Rapid-onset hazards last over periods of minutes to several days and examples

include major cyclones accompanied by high winds, waves and surges or tsunamis created by submarine earthquakes and landslides. Slow-onset hazards develop incrementally over longer time periods and examples include erosion and gradual inundation

Introduction

Since early civilisation, coastal areas have been attractive settling grounds for human population as they provided abundant marine resources, fertile agricultural land and possibilities for trade and transport. This has led to high population densities and high levels of development in many coastal areas and this trend is continuing into the 21st century. At present, about 1,2 billion people live in coastal areas globally, and this number is predicted to
increase to 1,8-5,2 billion by the 2080s due to a combination of population growth and coastal migration. Along with this increase follows major investments in infrastructure and the build environment.

The characteristics of coastal environments, however, pose some great challenges to human habitation. Coastlines are highly dynamic natural systems that interact

Cyclonic Disaster Hudhud

Very Severe Cyclonic Storm Hudhud was the strongest tropical cyclone of 2014 within the North Indian Ocean, as well as the costliest storm in the basin since Cyclone Jal in 2010.

Hudhud originated from a low pressure that formed under the influence of an upper-air cyclonic circulation in the Andaman Sea on October 6. The system drifted westward and intensified into a depresion and subsequently into a deep depression the following day. Owing to favorable environmental conditions, Hudhud intensified into a cyclonic storm on October 8. Its convection consolidated in the following hours, and Hudhud became a Severe Cyclonic Storm on October 9. Hudhud underwent rapid deepening in the following days and was classified as a Very Severe Cyclonic Storm by the IMD. Shortly before landfall near Visakhapatnam, Andhra Pradesh on October 12, Hudhud reached its peak strength with three minute wind speeds of 175 km/h (109 mph) and a minimum central pressure of 960 mbar (28.35 inHg). The system drifted northwards over land and was last noted as a well-marked low pressure area over east Uttar Pradesh on October 14.

The name *Hudhud*, suggested by Oman, refers to the bird Hoopoe. The bird is known as the "hudhud" in the Quran, and appears in the story of Sulayman

Under the influence of an upper air cyclonic circulation, a low pressure area formed over Andaman Sea on October 6.[7] It slowly consolidated and was upgraded to a depression by the India Meteorological Department (IMD) on October 7. While over open waters, the depression continued to encounter favorable environment, and a tropical cyclone formation

Alert (TCFA) was issued by the Joint Typhoon Warning Center (JTWC), followed by IMD upgrading the storm into a deep depression.[8][9]

In the early hours of October 8, the JTWC started issuing its advisories for the system as it recorded tropical storm winds at the storm's centre.[10] The IMD later reported that the deep depression made its first landfall over Long Island, Andaman and had reached cyclonic storm intensity, naming it *Hudhud*.[11] After

An alert was sounded in nine out of thirteen districts of Andhra Pradesh where standing crop of paddy, followed by groundnut, sugarcane, pulses and other horticulture crops were yet to be harvested. Over 700,000 people, including 500,000 people in AP, have been evacuated and put up in relief camps. The local government made adequate arrangement to shift half a million people in all.

Hudhud crossed the coast of Andhra Pradesh at 11:30 AM IST of October 12 near Pudimadaka, about 50 km fromVisakhapatnam with winds exceeding 185 km/h (115 mph). As per initial reports, 3 people were killed due to heavy rainfall accompanied by strong winds in coastal areas. Within hours after hitting the coast, the cyclone severed off the radar link of Visakhapatnam Cyclone Warning Centre.

On October 13th it was announced that Hudhud had caused at least 24 deaths within Andhra Pradesh and early estimates peg total damage costs at 100 billion rupees (US$1.63 billion)-This makes Hudhud the first storm in the basin to cause at least $1 billion in damage since Jal in 2010.

Visakhapatnam, also known as Vizag, bore the brunt of Hudhud, which hit its coast with the speed of 185 kmph. Hundreds of vehicles parked on roads were damaged while heavy rains inundated few colonies.

Odisha

The Odisha government had placed 16 districts under high alert. The districts alerted in Odisha
were Balasore, Kendrapara,Bhadrak, Jagatsinghpur, Puri, Ganjam, Mayurbhanj, Jajpur, Cutta ck, Khurdha, Nayagarh, Gajapati, Dhenkanal, Keonjhar,Malkangiri and Koraput.

At the time of the storm's landfall, strong winds and heavy rainfall commenced in southern Odisha districts leading to disruption in power supply. Wind speeds reaching 90 km/h (56 mph) were predicted in the region.

Relief Fund

PM Narendra Modi announced Rs 1000 crore-aid for the cyclone affected areas in Andhra Pradesh by the Centre.

A **cold wave** (known in some regions as *cold snap*) is a weather phenomenon that is distinguished by a cooling of the air. Specifically, as used by the U.S. National Weather

southern Spain that might be grown for wintertime consumption farther north, or to such all-year

tropical or subtropical crops as citrus fruits. Likewise, abnormal cold waves that penetrate into tropical countries in which people do not customarily insulate houses or have reliable heating may cause hypothermia and even frostbite.

Cold waves that bring unexpected freezes and frosts during the growing season in mid-
latitude zones can kill plants during the early and most vulnerable stages of growth.

in crop failure as plants are killed before they can be harvestedeconomically. Such cold waves have caused famines. At times as deadly to plants as drought, cold waves can leave a land in danger of later brush and forest fires that consume dead biomass. One extreme was the so-called Year Without a Summer of 1816, one of several years during the 1810s in which numerous crops failed during freakish summer cold snaps after volcanic eruptions that reduced incoming sunlight.

a **cyclone** is an area of closed, circular fluid motion rotating in the same direction as the Earth. This is usually characterized by inward spiraling winds that rotate anti-clockwise in theNorthern Hemisphere and clockwise in the Southern Hemisphere of the Earth. Most large-scale cyclonic circulations are centered on areas oflow atmospheric pressure. The largest low-pressure systems arecold-core polar cyclones and extratropical cyclones which lie on thesynoptic scale. According to the NHC glossary, warm-_core cyclones such as tropical cyclones and subtropical cyclones also lie within the synoptic scale. Mesocyclones, tornadoes and dust devils lie within the smaller mesoscale. Upper level cyclones can exist without the presence of a surface low, and can pinch off from the base of theTropical Upper Tropospheric Trough during the summer months in the Northern_Hemisphere. Cyclones have also been seen on extraterrestrial planets, such as Mars and Neptune.[7][8] Cyclogenesis describes the process of cyclone formation

eastern Maharashtra, northern Karnataka, Andhra Pradesh, Odisha, Gujarat, and Rajasthan.

In the past, droughts have periodically led to major Indian famines, including the Bengal famine of 1770, in which up to one third of the population in affected areas died; the 1876– 1877 famine, in which over five million people died; and the 1899 famine, in which over 4.5 million died

Factors Influencing Erosion

he **climatic factors** that influence erosion are rainfall amount, intensity, and frequency. During periods of frequent rainfall, a greater percentage of the rainfall will become runoff. This is due to high soil moisture or saturated conditions.

Temperature is another climatic factor influencing erosion. While frozen soil is highly resistant to erosion, rapid thawing of the soil surface brought on by warm rains can lead to serious erosion. Temperature also influences the type of precipitation. Falling snow does not erode, however, heavy snow melts in the spring can cause considerable runoff damage.

Temperature also influences the amount of organic matter that collects on the ground surface and incorporates with the topsoil layer. Areas with warmer climates have thinner organic cover on the soil. Organic matter protects the soil by shielding it from the impact of falling rain and soaking up rainfall that would otherwise become runoff.

Physical **characteristics of soil** have a bearing on erodibility. Soil properties influencing erodibility include texture, structure and cohesion. Texture refers to the size or combination of sizes of the individual soil particles.

Three broad size classifications, ranging from small to large, are clay, silt, and sand. Soil having a large amount of silt-sized particles are most susceptible to erosion from both wind and water. Soil with clay or sand-sized particles are less prone to erosion.

and widespread power outages due to increased use of air conditioning. A heat wave is considered extreme weather, and a danger because heat and sunlight may overheat the human body.

How they occur

Heat waves form when high pressure aloft (from 10,000–25,000 feet (3,000–7,600 metres)) strengthens and remains over a region for several days up to several weeks. This is common in summer (in both Northern and Southern Hemispheres) as the jet stream 'follows the sun'. On the equator side of the jet stream, in the middle layers of the atmosphere, is the high pressure area.

Summertime weather patterns are generally slower to change than in winter. As a result, this mid-level high pressure also moves slowly. Under high pressure, the air subsides (sinks) toward the surface. This sinking air acts as a dome capping the atmosphere.

This cap helps to trap heat instead of allowing it to lift. Without the lift there is little or no convection and therefore little or no convective clouds (cumulus clouds) with minimal chances for rain. The end result is a continual build-up of heat at the surface that we experience as a heat wave.

In the Eastern United States a heat wave can occur when a high pressure system originating in the Gulf of Mexico becomes stationary just off the Atlantic Seaboard (typically known as a Bermuda High). Hot humid air masses form over the Gulf of Mexico and the Caribbean Sea while hot dry air masses form over the desert Southwest and northern Mexico. The SW winds on the back side of the High continue to pump hot, humid Gulf air

northeastward resulting in a spell of hot and humid weather for much of the Eastern States.

In the Western Cape Province of South Africa, a heat wave can occur when a low pressure offshore and high pressure inland combine to form a Bergwind. The air warms as it descends from the Karoo interior, and the temperature will rise about 10 °C from the interior to the coast. Humidities are usually very low, and the temperatures can be over 40 °C in summer. The highest official temperatures recorded in South Africa (51.5 °C) was recorded one summer during a bergwind occurring along the Eastern Cape coastline.

Global warming boosts the probability of extreme weather events, like heat waves, far more than it boosts more moderate events.

The government planned the reconstruction and rehabilitation phase to be spread over three to five years (GOSL, 2005c). Nevertheless, there were pronouncements at the political level that all permanent housing needs would be met within a year. Over time, it has become clear that these were optimistic pledges. In fact, housing needs, for example, had not been met fully even by the end of 2006, while reconstruction of damaged schools and hospitals, and rehabilitation of roads, bridges, etc. is likely to take longer than envisaged.

5.1.1 Infrastructure

A total of 182 schools and 222 health institutions were affected by the tsunami. Targets in the education and health sectors included the reconstruction and renovation of 183 schools, four universities, seven Vocational Training Authorities, 444 internally displaced person (IDP) schools (schools used as refugee camps), and the reconstruction and renovation of 102 health institutions.

The pace of recovery, particularly of larger scale infrastructure projects, has been slow with an estimated 50 per cent of construction projects yet to commence by end 2006 (GOSL, 2006). By end 2006, 57 per cent of damaged schools were estimated to be in various stages of construction with only 10 per cent of projects completed and handed over (GOSL, 2006). Similarly, in the health sector only 55 of a total of 102 damaged buildings have been completed (**Table 4** [PDF 62.2KB | 1 page]).

The bulk of infrastructure damage was to roads and railways . A total length of approximately 800 kilometres of national road network and 1,500 kilometres of provincial and local government roads were damaged. The railway infrastructure on a 160- kilometre-long stretch along the tsunami-affected coastline was also severely damaged. The target date for completion of road and bridge reconstruction was set at 2009. As we shall discuss below, this target date may prove difficult to meet

donor-built housing reconstruction and (ii) home owner-driven housing reconstruction. No reconstruction of houses (partially or fully damaged) was to be allowed within the buffer zone. Thus, all affected households within the demarcated buffer zone were to be provided with a house built with donor assistance on land allocated by the state while allowing them to retain ownership of the original land. Households were not required to demonstrate ownership of the land to qualify for such assistance.

For those whose damaged houses were deemed to be outside the designated buffer zone, the government agreed to provide grants and loans for households to re-build at the same location. In order to qualify for the entitlement, households were required to prove ownership of the land. The criteria set down in terms of financing such reconstruction included an assessment of damages on a points basis where a house deemed to be more than 40 per cent damaged would qualify for a grant of SLRs.250,000 (US$2,500) in four instalments, based on progress. A grant of SLRs.100,000 (US$1,000) was made available to rebuild a house deemed to be less than 40 per cent damaged, disbursed in two stages.

Predictably, the buffer zone became a politically controversial issue from the very outset. The limits were set in a fairly arbitrary manner, not taking into account topographical and other relevant features of the land that would affect hazard risk. There was also dissatisfaction that the rules were not to be applied across all building units, with tourist enterprises being permitted to rebuild within the designated zone. Many of the tsunamiaffected fishermen, for example, argued the need to retain land close to the sea to sustain their livelihoods.

However, IPS-TS 2006 results showed that about 60 per cent of surveyed households thought that the government's original buffer zone rule was a "good idea." Data at the Grama Niladari Division (GND) level agreed with this finding; almost all Grama Niladaris (GNs) (village level government officers) interviewed agreed that the government's original buffer zone policy was "good." Paradoxically, they were also happy with the relaxation of the buffer zone in 2006.

the GOSL was to provide the cash grant, initially reimbursed by different development banks and bilateral donors.–The grant of SLRs.250,000 (US$2,500) each from the government and donors was to be given in instalments; a first instalment of SLRs.50,000 (US$500) by the government matched equally by the donor and thereafter followed accordingly. The beneficiary was to receive full title to the property in the resettlement area (while retaining legal ownership of property within the re-designated buffer zone).

available common infrastructure for housing clusters, and the government was to provide services up to the relocation site. The technical specifications were revised to ensure a more equitable basis. This was primarily a response to the initial experience where donors build houses of widely varying quality, with some houses costing only SLRs.400,000 and others
being valued at over SLRs.1 million (US$4,000 to over US$10,000), causing friction amongst recipients.

The new housing policy requirements are identified under a homeowner-driven programme and a relocation housing programme. Overall, revisions to the housing policy (involving a higher cash grant component and a significant increase in the number of housing units deemed necessary) meant that questions would be raised about the ability to meet the costs of reconstruction within the commitments made by donors. It also created much confusion amongst the beneficiary households. Only about a quarter of the households surveyed in the IPS-TS 2006 were clear about their housing entitlements. Close to 60 per cent indicated that they would like legal advice regarding their rights as a homeowner.

Table 7: Housing Requirements

As of November 2006, 46,531 partially or fully damaged houses had been rehabilitated, recording an 85 per cent completion rate. Nevertheless, a funding

government officials, the reluctance of local non-government agencies to share information on aid distribution and their beneficiaries exacerbated the problem of coordination and monitoring.

Table 9 confirms the significant regional variation in housing progress across the country. The uneven progress is, in part, due to the resurgence of conflict in the north and east of the country from end 2005 (**Figure 1** . The Eastern Province with the highest requirement of housing is lagging well behind. The Western Province was also behind the Southern Province, most likely due to greater difficulties in obtaining suitable land. The survey results were consistent with national data and showed that housing progress was best in the Southern Province for those outside the 2005 buffer zone. Less than 6 per cent of surveyed households in this region were in temporary housing. Housing progress was worst for those in the Eastern Province—for households both within and outside the 2005 buffer zone. Progress was especially poor for households affected by the conflict.

Key reasons cited for the overall slow progress in housing relocation haveincluded a lack of commitment by nongovernment organizations (NGOs)impact of the conflict, lack of infrastructure in new locations, and poor communications strategies. In the case of donor housing, it has been pointed out that many donors that had large amounts of funds at their disposal and had pledged to build large numbers of housing units failed to meet even 50 per cent of their original targets (GOSL, 2006).

These findings are consistent with the survey results: lack of land and delays in obtaining

donor assistance were cited as the main reasons for the slow progress in the donor-driven housing programme. The survey results also suggested that some people found that they were worse-off in terms of quality of housing and access to services (**Table 10**. There were claims that people's lifestyles were not taken

thirds of their pledges (US$25 million)), INGOs showed no enthusiasm to transfer funds to the government.

Escalating costs of building materials and skilled construction labour may also have contributed to slow progress in housing. All interviewed key informants reported that the cost of building materials and the wages of carpenters and masons had increased since the tsunami, with more than three-quarters stating that construction costs had increased by "a lot."

5.1.3 Livelihoods

An estimated 150,000 people lost their main source of income because of the tsunami. About 50 per cent of these were in the fisheries sector, with others distributed among agriculture (4–5 per cent), tourism, and small and micro enterprise-related sectors (GOSL, 2005a). In all surveyed districts, people received some livelihood support. Types of
livelihood assistance have included grants in kind (income-generating assets such as fishing boats and equipment), cash grants, loans, training (vocational, business support, etc.), cash-for-work, and temporary employment.

According to official sources, around 75 per cent of the affected families had regained their main source of income by end 2005 (GOSL, 2005a). This is supported by the survey results where 71 per cent of interviewed households claimed they had regained their previous source of livelihood. Only 8 per cent of heads of households had changed their livelihood,–while 21 per cent were still unemployed.–Thus, within a year of the tsunami, most people were back in their previous occupations. However, this did not mean

that people regained their previous level of income. According to our householdlevel survey, on average close to 60 per cent of households considered their real family income—in terms of their ability to cover basic needs such as food and health—to be lower than their pre-tsunami income.

By contrast, recovery of fisheries-related livelihoods was swifter despite the fact that this was the most badly affected sector. Those engaged in fishing or related activities made up over one-third of the affected households. In total, over 100,000 people in the fisheries sector were displaced, 16,434 houses were damaged and 13,329 destroyed, and nearly 4,870 fishermen lost their lives with a further 136 reported missing (MFAR, 2006). In terms of equipment, as set out in an estimated 75 per cent of the fishing fleet (32,000 boats) had been totally destroyed or severely damaged (around 23 per cent were made un-seaworthy and 54 per cent were destroyed), and one million fishing nets were lost. Apart from these, the basic infrastructure of the fishing industry, such as boatyards, cold rooms, ice plants, and fish markets, were damaged. Damage to fishery harbours and other infrastructure facilities, government services facilities, coast conservation structures, etc., was placed at US$275 million, while repair and replacement costs for the damaged fleet were estimated at US$60 million.

By end 2006, the fisheries harvest had been restored to 70 per cent of the pre-tsunami level

with most of the affected fishers returning to their occupation (GOSL, 2006) The relatively rapid recovery of the fisheries sector can be attributed primarily to the relatively rapid progress in replacement of the fishing boats and equipment. The fisheries sector received more immediate assistance than other affected sectors and was able to replace most of its productive assets fairly quickly. A large proportion of destroyed boats had been replaced, and all damaged boats were repaired by end 2005.

However, there have been complaints about the poor quality of repairs. According to results of a survey carried out in December 2005, 8 per cent of the repaired boats were not being used due to dissatisfaction with the repairs. Inadequate technical inputs and/or supervision, lack of boat-building knowledge and expertise on the part of NGOs (as well as the fishers), and the absence of proper contracts for after-sales services are blamed for poor-quality repairs, with boat-builders using low-quality material, reducing the thickness, etc., to meet deadlines and profit from the opportunity.

cent) boats distributed went to "genuine" beneficiaries. Some small, local agencies had provided boats to "friends and relatives" and had bypassed the fishing authorities.

Access to credit is a vital element for livelihood recovery. Most of the tsunami-affected businesses were informal, small-scale industries—an estimated 25,000 microenterprises were damaged in the disaster. In addition, 15,000 tsunami survivors were previously involved in self-employed and informal sector activities such as food processing, coir manufacture, carpentry, and

tailoring. While over forty organizations were involved in a host of micro-finance programmes established to assist small- and medium-sized enterprises (SMEs), the primary sources of credit were two major government finance schemes.

Prior to the tsunami, the Central Bank of Sri Lanka had been implementing a microfinance scheme (Susahana) through the two state-owned commercial banks. The Susahana loan is provided with no repayment required for the first year and interest at a fixed rate of 6 per cent thereafter. The National Development Trust Fund (NDTF) also offered similar terms through

its partner organizations. Following the tsunami, lending escalated and by June 2006, 25,735 loans and grants of SLRs.4,769 million (US$47 million) had been provided to micro-, small-, and medium-sized enterprises (RADA, 2006). The majority of these loans were disbursed in the south and west of the country. The Susahana scheme had reportedly disbursed US$36 million to 8,000 borrowers in the tsunami-affected areas by September 2005. Of these loans, 75 per cent were in the south and west of the country. 60 per cent of the NDTF scheme was also disbursed in the south, with only 40 per cent going to the north and east of the country (GOSL, 2005a).

Unfortunately, the procedures and processes associated with loan approval and disbursement seemed weighted against those worst-affected by the tsunami, with the emphasis placed on ensuring high probability of repayment or loan recovery rather than on meeting the credit needs of those most in need. Despite claims to the contrary, and its stated intention to reach the micro-entrepreneurs, the Susahana lending scheme had been set up in a way that made it very difficult for small tsunami-affected microentrepreneurs to obtain access to the loans. The conditions for access were quite onerous. Guarantors with a permanent income above a certain threshold level were required before a loan was approved. Collateral was required, for

about the need for proper targeting. The Ministry of Finance Directives then directed local government officials to revise the lists of eligible beneficiaries according to a set of eligibility criteria. There were
complaints from both affected families and even some government officials that the criteria were not very clear, or were not in the public domain. This created much confusion and payments halted at a time of acute need. The government circulars announcing the revised criteria were quite broad. This meant that local government officers had considerable room to exercise discretion, resulting in wide variations in interpretation, allegations of corruption, and delays and long back-logs of appeals. Interviews with relevant stakeholders, including both affected families and government officials, suggested that households having access to "regular income" were no longer eligible. It took several months to draw up new lists of those eligible to receive the grant, with the number of recipients eligible for the third payment declining by 25 per cent to 165,000 while the

fourth monthly payment was still "on-going" a year after the tsunami (GOSL, 2005a).

In assessing the value and benefits of changes to this programme, it should be noted that even households with a "regular" post-tsunami income had suffered a major loss of wealth in terms of property and possessions, and were cash poor. There was a high probability that they would have to borrow from high interest, informal sector lenders to meet many pressing needs. The decision to take recipients with a regular income off the list after only two monthly payments generated perverse incentives, effectively penalizing not only those who had held on to previous jobs, but perhaps, even more importantly, those who had managed to obtain regular employment after the tsunami. If donor assistance was available for this programme—and it is hard to see why funds were not available if the May 2005 pledges were honoured—these cutbacks seem hard to justify. Moreover, since bank accounts had to be opened for the cash

programme (Samurdhi): the leakage in the Samurdhi programme is estimated to be 40 per cent!

5.1.4 Trauma and Stress

The survey found some evidence of mental and physical health problems related to the tsunami. About 11 per cent of the households knew someone who had committed suicide because of the tsunami. There were reports of more sleeping difficulties, and children experiencing nightmares that were linked to trauma associated with the tsunami. A large number of households—33 per cent of households in the sample—had been offered or given counselling for distress. The percentage of people who received counselling was higher in the Eastern Province, possibly because counselling was already taking place in those areas for sufferers of conflict-related mental health problems.

Twelve per cent of households had family members who had been injured in the tsunami or whose health had deteriorated afterwards: A large proportion of such households (77 per cent) claimed that this affected their income-earning capacity and/or day-to-day activities.

In many cases, the decline in school attendance after the tsunami has not been fully reversed and attendance was reported to be poor even at the end of 2006, with over 25 per cent of children still not attending school (GOSL, 2006). These findings are supported by the survey; nearly 30 per cent of households reported having children who had not yet restarted schooling after the tsunami. The schooling problem existed in areas other than just those affected by conflict, indicating that the problem cannot solely be attributed to the conflict. Thirty-one per cent of the households reported that the performance of children who were attending school had fallen.

5.2 Assistance

There was a strong international public response to the appeal for recovery assistance. Multilateral and bilateral donors and NGOs pledged US$3.4 billion for post-tsunami recovery activities at the first Sri Lanka Development Forum held in May 2005 (MFP, 2005; GOSL, 2006). This comprised (concessional) loans amounting to US$798 million and the balance in grants. NGOs pledged a total of US$853 million on a grant basis. The International Monetary Fund pledged US$268 million by way of both emergency relief and a debt moratorium.

procedures), and excessive conditionality imposed by donors. Another important factor has been the non-availability of adequate counterpart funds (local funds with appropriation).

Despite the initial euphoria in the aftermath of the tsunami about the volume and adequacy of foreign assistance, it became clear over time that a substantial proportion of reconstruction would have to be domestically financed. In 2006, the government had committed US$1.5 billion in domestic funds (over one-third of total reconstruction costs as initially estimated) for tsunami reconstruction. Thus, at the end of two years, two problems with the funding of the reconstruction effort could be identified: the inability of the country to utilise available

foreign assistance in a timely manner, and a widening gap between the actual amount of foreign assistance received and reconstruction requirements.

5.3 Delivery and Coordination of Assistance

Coordination of the relief and reconstruction effort emerged as a key issue from the

beginning of the relief effort, and it continued to be a major issue as the reconstruction and recovery phase started. In Sri Lanka, coordination was required across three groups: (a) among the various government agencies, (b) between the numerous donor agencies, and (c) with the LTTE which was in de facto control of a part of the country that was heavily affected by the tsunami. Sri Lanka's governance structure is such that provincial government agencies have considerable powers, and this meant that coordination was required not only between the various central government agencies, but also between the central government and local government agencies. The involvement of major bilateral and multilateral donor agencies naturally required that their activities be coordinated, both among themselves and with the government. Sri Lanka has long experience working with major donor agencies and several INGOs maintain long established operations in the country. There had been some welcome moves towards donor coordination even prior to the tsunami in the

In November 2005, a decision was taken to amalgamate TAFREN, TAFOR, and the Task Force for Logistics and Law and Order (TAFLOL) into the Reconstruction and Development Authority (RADA). RADA was given wide powers by an Act of Parliament. It was given authority over organizations working on post-tsunami reconstruction and development, and could monitor and control their activities as well as issue "licenses" that would provide legal authority for them to carry out specific activities. In theory, this would enable RADA to exercise efficient coordination. However, potential drawbacks to the vesting of such wide powers in a single, centralised body are that it could overly limit the powers of all other agencies and actors, ignore inputs and feedback from line ministries and local-level agents, reduce flexibility and scope for local initiatives and actions, and make the reconstruction effort too centrally-driven.

Field observations confirmed that lack of adequate coordination resulted in considerable mal-distribution of aid. This was clearly visible, for example, in the way that the distribution of new boats had been conducted, and—as described in a report by the Auditor General—in payment of housing assistance.[28] Large payments were made for houses with minor or no
damage, NGOs provided houses to families who were not at all affected by the tsunami, and government grants were given to people who had already received houses constructed by NGOs.

The lack of adequate coordination was not only due to weaknesses on the part of the government-established coordinating bodies. A major problem was that some NGOs were

simply not willing to be "coordinated," preferring to act alone pursuing their own agendas. INGOs, as well as some domestic NGOs (particularly those with good foreign links), had access to relatively large amounts of money. With their own funds secure, they saw few incentives to improve coordination. In fact, some

after the tsunami, a mutually acceptable arrangement for aid-sharing to enable assistance to flow into the LTTE-controlled areas proved elusive. Sections within the government and within the majority community were opposed to any deal that even appeared to provide de facto recognition of the LTTE as the administrative power in regions controlled by it. The LTTE, for its part, was unwilling to accept an arrangement that diluted its administrative and political power in areas under its control. After long, drawn-out negotiations, a MOU setting out an aid-sharing deal

between the GOSL and the LTTE, the Post-Tsunami Operation Management Structure (P-TOMS), was signed in June 2005. The P-TOMS agreement envisaged the setting up of a Regional Fund to allow donors to channel tsunami funds directly to the Northern and Eastern Provinces. A multilateral agency (anticipated to be the World Bank) was to be appointed as the custodian.

However, this agreement promptly ran into political opposition. It was challenged in the

courts through a fundamental rights petition and the Supreme Court ruled in July 2005 that certain elements were to be put on hold pending clarification, though the overall mechanism was not unconstitutional. The situation was aggravated further by the fact that several major donors who had supported the idea of a joint mechanism for aid distribution between the GOSL and the LTTE declined to channel aid directly to the Regional Fund once the MOU was signed, claiming that the LTTE remains a "proscribed terrorist organization" in their countries. After the presidential election in November 2005, with the election of a new President who publicly opposed the agreement, P-TOMS became totally inoperative. The conflict between the GOSL and the LTTE intensified soon after. The renewed violence disrupted not only the lives of the tsunami-affected people in the area, but also led to a sharp increase in internally displaced persons, placing further pressure on aid agencies. There can be little doubt that these problems led to inequitable distribution of aid, with the most severely affected North and East missing out on their fair share.

higher wages for skilled labourers (such as carpenters, painters, and masons), whose wages have doubled in some locations. This is confirmed by data from the construction industry body, the Institute for Construction Training and Development (ICTA)

Prices of particular building materials, such as cement, sand and bricks, saw a sharp increase. However, it should also be noted that price increases for importable materials were significantly lower than overall construction cost increases. These data are consistent with survey information: More than three-quarters of the surveyed key informants said that wages of carpenters and masons and prices of building materials had increased "a lot" since the tsunami. This has some important implications: Increased local demand can be met without major price increases when construction materials are importable, but price increases are unavoidable for domestically sourced ("non-tradeable") materials and labour. The faster

the reconstruction programme, the higher the price and cost escalation will be, with less "construction" actually occurring for a given amount of expenditure.

5.5 Broader Economic Impacts

The typical pattern for economies struck by unanticipated natural disasters has been to experience a brief deceleration in growth, followed by a rebound as a result of the stimulus from reconstruction programmes. GDP growth dipped in the first quarter of 2005 but subsequently showed a strong resurgence. Predictably, the fisheries and hotels and restaurants sub-sectors experienced a sharp contraction in output while the construction sub-sector experienced strong growth . The recovery was better than initially anticipated, and was broad-based. There was continued expansion in industry and services, as well as a

friends, the increase could also reflect better earnings performance of the majority of migrants employed in the oil rich Middle Eastern countries. Sri Lanka managed to record an overall surplus of US$500 million on the BOP in 2005 (compared with a deficit of US$205 million in 2004) and official reserves showed a sharp improvement.

Nominal and Real Effective Exchange Rate

The influx of increased foreign capital reversed the sharp devaluation of the rupee vis-àvis the US dollar at end 2004, leading to a nominal appreciation of over 5.5 per cent in the week following the disaster.The nominal effective exchange rate (NEER) appreciated by 7.7 percent in 2005 (compared to a depreciation of 11 per cent in 2004).

The higher nominal appreciation in the context of relatively high domestic inflation led to a real effective exchange rate (REER) appreciation of 12.7 per cent (as against a depreciation of 1.1 per cent in 2004). To the extent that this real appreciation was a result of tsunami-related aid flows, it would have had the standard Dutch disease effects on Sri Lanka's exports.

Aid flows following a disaster are, by their nature, temporary. As the tsunami-related capital inflows eased over time, the government was compelled to seek other forms of external funds to finance the expanding fiscal deficit. In December 2005 Sri Lanka sought a sovereign credit rating as the first step to raising an estimated US$0.5–1 billion in the international bond market. Sri Lanka was assigned a BB- (below

investment grade) and a B+ by two rating agencies. But, with the escalation in domestic hostilities the credit outlook was downgraded from stable to negative in April 2006. In 2006, for example, the government raised US$580 million by issuing 2–3-year maturity dollar bonds (Sri Lanka Development Bonds) at rates of 120–140 basis points above the London Inter-Bank Offer Rate (LIBOR) despite the inherent risks involved in recourse to foreign commercial borrowings.

CIVIL

ENGINEERING

TUTORIAL

QUESTION

BANK

Course Title	**DISASTER MANAGEMENT**			
Course Code				
Regulation	**R16-JNTUH**			
Course Structure	Lectures	Tutorials	Practicals	Credits
	4	-	-	4
Course Coordinator	Mr. MD TOUFEEQ, Assistant Professor, Civil Engineering			
Team of Instructors	Mr. , MD TOUFEEQ, Civil Engineering			

PART – A (Short Answer Questions)

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT – I		
1	Write a note on environmental hazards.	Remember	1,2
2	What is the difference between natural disaster and man-made disasters?	Understand	1,2
3	Write two impact of disaster has on community.	Remember	1,2
4	Write briefly about how hazards can become a disaster.	Analyze	1,2
5	What is a disaster? Explain the concept of disaster.	Understand	1,2
6	Discuss the environmental stress in the atmosphere	Understand	1,2
7	Write the concept of Environmental Hazards.	Remember	1,2
8	Define biological hazards.	Analyze	1,2
9	What is mean by flash flood?	Remember	1,2

10	Discuss about chemical and physical hazards.	Remember	1,2
	UNIT – II		
1	What is a disaster? Classify.	Understand	2,3
2	Write a note on social hazard.	Remember	2,3
3	Write a short note on effects of cyclones	Remember	2,3
4	Describe civil disorder	Knowledge	2,3
5	what are the types of man-Induced hazards discuss?	Understand	2,3
6	write down the various types of natural hazards	Understand	2,3
7	Discuss about the planetary and extra-planetary hazard	Understand	2,3
8	write a note on meteorological hazards.	Analyze	2,3
9	what is earthquake hazard? What causes earthquake.	Analyze	2,3
10	What are the harmful effects of earthquakes	Remember	2,3
	UNIT – III		
1.	Write a brief note on volcanoes. What are the hazards involved?	Analyze	3,4
2.	What are the effects of the volcanoes on the environment?	Remember, Analyze	3,4
3.	Explain briefly about the effects of earthquakes on the environment.	Differentiate	3,4
4.	What are the different types of disaster? write short note.	Understand	3,4
5.	What is a disaster? Give an example from a real incident.	Analyze	3,4
6.	What is Endogenous Hazards?	Remember	3,4
7.	What are the causes and hazardous effects of Volcanic eruptions?	Understand	3,4
8	Write down the different types of atmospheric hazards.	Analyze	3,4
	UNIT - IV		
1.	What are cyclones? Describe	Understand	4
2.	Write a note on the formation of cyclones.	Remember	4
3.	Write in short about the structure of cyclone.	Analyze	4
4.	Write a short note on effect of cyclones.	Remember	4
5.	Write a short note on the global distribution of cyclones.	Remember	4,5
6.	Can you suggest some ways and methods to destroy cyclones.	Remember	4,5
7.	Discuss some of the measures to mitigate cyclones.	Remember	5
8.	What causes lightning and hailstorms? Explain.	Remember	3,4
9.	Write a note on floods and discuss its types and causes.	Remember	4
10	Discuss the flood-prone regions in India.	Analyze	3,4
	UNIT - V		
1	Enlist the different stages of disaster management. Write in detail about pre-disaster stage.	Remember	6,7
2	Write short notes on mitigation planning.	Remember	7
3	State the guidelines for mitigation of disasters.	Remember	7
4	What is mitigation?	Analyze	6,7
5	Explain natural disasters and its mitigation strategies.	Understan	6,7

	.		
3	Write an account on different approaches to disaster management and relation with human ecology.	Understand	1,2
4	Write a note on chemical and biological hazards.	Remember	1,2
5	Write an account on geomorphic (geological) hazards.	Remember	
6	What is meant by human ecology? How it is related to Disasters.	Analyze	1,2
7	Write down the types of environmental hazards and Disaters?	Understand	1,2
8	Define human Ecology? What are the field of applications in geographical Researchers.	Understand	1,2
9	Discuss about Ecosystem Approach and perception approach	Understand	1,2
	UNIT - II		
1	Write short notes on: a) cold waves b) Heat waves c) Soil Erosion	Remember	2,3
2	Write a brief note on floods as a serious environmental hazard.	Understand	2,3
3	What are the consequences of the phenomenon of drought? Explain briefly.	Remember	2,3
4	Explain sea level rise. What are its causes and effects?	Analyze	2,3
5	Write a note on global atmospheric changes.	Analyze	2,3
6	What is the difference between natural disaster and man-made disaster?	Analyze	2,3
7	Draw a flow chart of planetary and extra planetary hazard and explain.	Understand	1,2
8	Write a brief note on the extra planetary hazards.	Remember	3
9	What are floods? What are the harmful effects of floods.	Analyze	2,3
10	Write down the methods of controlling floods.	Understand	2,3
	UNIT-III		
1	Write a short note on earthquakes. What are its causes?	Analyze	4
2	What are the mitigation measures to be taken at the time of earthquakes?	Understand, Analyze	4
3	Write a note on man-made landslides. State what are the mitigation measures at the time of land-slides.	Understand	4
4	What are the environmental Impacts of Volcanic Erruptions?	Remember	4
5	What is epicenter and focus ? draw with a neat diagram? Based on depth how many types of earthquake are classified.	Analyze	4
6	What ais endogeneous hazards ? Explain with examples in detail.	Analyze	4

	Discuss in brief the various floods control measures.		
3	Discuss some of the measures to mitigate floods.	Understand	5
4	What are the consequences of drought? Explain briefly	Remember	5
5	Write a note on the drought control measures adopted across the globe.	Remember	5,6
6	Enumerate the properties of soil	Apply	5,6
7	Write a brief note on soil erosion and its conservation.	Understand	6
8	What is sedimentation? What are the different aspects in this process?	Evaluate	6
9	What are the various sedimentation problems created in the environment.	Evaluate, Analyze	6
10	Suggest the best management practices of soil erosion and sedimentation.	Analyze	5
	UNIT - V		
1	Write a brief note on the emergency stage of a disaster.	Apply	7
2	Write an account on the impact of disasters to life and environment.	Evaluate	7
3	Discuss the role of technology in disaster management.	Evaluate	5,6
4	Write the methods to predict natural disasters.	Evaluate	5
5	What is cyclone? How can people be warned of it beforehand? Give an example from a real incident when warning against a cyclone helped the people.	Apply	4,5
6	Discuss the various measures that should be taken for disaster management and prevention	Analyze	7
7	Write in brief on the post-disaster stage.	Apply	7
8	Write a note on disaster management.	Apply	7
9	Explain the phases of disaster management	Analyze	5,6
10		Apply	7

Group - III (Analytical Questions)

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT - I		
1	What are steps involved in risk communication?	Understand	1
2	Explain, how the occurrence of EL NINO events affects global climate?	Understand	1
3	Describe natural disaster and list out the natural disaster	Understand	1,5
	UNIT – II		

3	What will be the consequences of drought when it affects an area very effectively?	Remembe r	2
4	Define cyber terrorism and explain forms and impacts	Understan d	2,3
5	Write a brief note on psychological and social dimensions of disaster	Apply	1,2
6	What is the difference between natural disaster and man-made disaster?	Remembe r	2,3
7	Describe manmade (anthropogenic disaster) disaster and list out the natural disaster	Understan d	2,3
8	Describe terrorism and write down the typology of terrorism	Remembe r	2,3
	UNIT - III		
1	Write a brief note on the distribution of volcanoes in the world.	Understan d	4
2	Comment on the distribution of earthquakes across the globe.	Evaluate	4
3	Explain how the magnitude of earthquake is determined.	Evaluate	4
4	Identify the earthquake hazards in india and explain	Evaluate	4
	UNIT - IV		
1	What are the effects of pesticides on the environment?	Understan d	5,6
2	Write a note on Bhopal on gas tragedy	Apply	5,6
	Write a short note on pesticide pollution.	Apply	5,6
4	What are the main causes of nuclear hazards?	Remember	5,6
5	Write a brief note on nuclear accidents and the Chernobyl disaster.	Creating	5,6
6	Write an account on the genetic disorders caused by radiation pollution.	Evaluate	5,6
7	Write a short note on population explosion and its control.	Remember	5,6
8	Write briefly about the steps that need to be taken as part of an overall plan for achieving global population stabilization.	Remember	5,6
9	Explain briefly the pattern of global population growth in recent years which is causing alarm to environmental experts.	Evaluate	5,6
10	Define urbanization. Give the reasons for large scale migration to urban areas and the consequences of rapid urbanization.	Apply	5,6
	UNIT - V		
1	Why should every village have a disaster management committee? Write a short notes.	Analyze	6,7
2	Why should every village have a disaster management committee? Write a short notes.	Remember	7

	affected people?		
5	How do engineered structures help us to withstand like floods, earthquakes, and cyclones?	Apply	6,7
6	Describe the structural mitigations and non- structural mitigations that should be restored to in case of floods.	Remember	7
7	Elaborate on the various organizations which are involved in the research and mitigation of disasters.	Apply	7
8	How does the community of a village play the most important role in times of disaster as 'first responder'	Evaluate	6,7
9	How can search rescue team assist a village in times of a hazards?	Understand	7
10	Enlist the various institutions and national centres involved in natural disaster reduction.	Apply	7

Earthquake

1. As the magnitude of natural disasters increases their frequency of occurrence_____.

A) increases B)decreases C)remains the same D) cannot be predicted

2. Which natural hazard has caused the greatest number of deaths in a single event?

A) earthquakes B)floods C)volcanic eruptions and related disasters D)hurricanes

3. Which natural hazard has resulted in the greatest monetary losses in a single event for the period of time listed? A) Earthquake B) hurricane C) fire D) flood

4. Which two natural hazards have caused the most damage both in terms of loss of life and monetary losses over the past 50 years on a global scale?

A) Hurricanes and volcanoes B) hurricanes and floods C) hurricanes and tornadoes D) Hurricanes and earthquakes

5. Why do you suppose there has been an overall increase in the number of deaths and monetary losses related to natural disasters on Earth?

a) The magnitudes of natural hazard events are increasing. b) Events are better documented today than in the past. c) Human populations are increasing in areas of risk. d) all of the above

6. An effect that natural disasters can have on people affected by the event is an increased rate of

_____. a) homicide b) immigration c)population growth d) all of these

7. The Earth's hu'an population is estimated at_____people.

A) 670 million B) 1000 million C) 4.6 billion D) 7 billion

8. The Earth is divided into layers that differ in composition and density. What is the proper sequence of these layers if they are listed from least dense to most dense?

A) inner core, outer core, mantle B) crust, mantle, core C) core, mantle, crust D)mantle, core, crust

9. Geologists consider the Earth to be 4.6 billion years old. If you counted to 4.6 billion by counting one number every second how long would it take?

A) 32 years B) 146 years C) 14,600 years D) 1000 years

10. The Earth's in'ernal heat is responsible for causing_____.

21. Tsunami is:

A. Earthquake on land mass B. Volcanic eruption C. Earthquake in ocean crust D. None of these 22.Which one of the following does not cause Earthquake?

A. Colliding plates B. Coral reefs C. Sliding plates D. Dividing plates

23. The point in the earth from which seismic waves spread out in all direction is:

A. Earthquake focus B. Siesmic Center C. Epi Centre D. None of these 24.Windows may rattle and people may feel tremor at scale of

A. 3 B. 4 C. 5 D. 2

Answer B

25. Vibrations radiate from focus in all direction as

A. Longitudinal waves B. Transverse waves C. Seismic waves D. Typanic waves Answer C

26. Approximate range of earthquakes that occur each year is

A. hundreds B. thousands C. millions D. billions Answer B

27. Poorly built buildings may collapse at a scale of A. 5 B. 6 C. 7 D. 8-10

Answer B 28.Richter scale is a

A. logarithmic scale B. calculus scale C. volumetric scale D. area to vibration ratio scale Answer A

29. Earthquakes occur most frequently at

A. plate surface B. plate boundaries C. plate vacuum D. ocean beds Answer B

30. Point at which earthquake takes place is known as

A. origin B. epicenter C. principal D. focus Answer D 31.Magnitude of earthquake indicates amount of

A. vibrations per second
B. vibrations per minute

TSUNAMI

1. What is a tsunami?
a) a type of fish b) a series of huge waves c) a kind of volcano d) Earthquake Answer: a series of huge waves

2. The term Tsunami is coined from?
a) Chinese term b) Indian term c) German term d) Japanese term Answer: Japanese term

3. Tsunamis are waves generated by ?
a) Earthquakes b) Volcanic eruptions c) Underwater landslides d) All the above Answer: All the above

4. Amateur Radio is also known as?
a) Ham radio b) Home radio c) Pocket radio d) Silent radio Answer: Ham radio

5. Tsunami can occur only during?
a) Morning b) Noon c) Evening d) Any time of day or nights Answer: Any time of day or nights

6. National Institute of Disaster management is located at?
a) Pune b) Midnapur c) New Delhi d) Calcutta Answer: New Delhi

6. Which of the following activities is covered by Disaster Management before, during or after a disaster?
a) Reconstruction and Rehabilitation b) Mitigation
c) Emergency response d) All the above Answer: All the above

7. International Tsunami Information Centre is in?
a) Honolalu b) Goa c) Jakartha d) Pondicherry Answer: Honolalu

8. What is the speed of tsunami waves?
a) 40 meters/hour b) 100 kms/hour c) 9000 km/hour d) 800 km/hour Answer: 800 Km/hour

9.If you were at the beach, how would you know there may be a tsunami?
a) There may be a warning b)An alert comes over the radio
c) There is a drop in the level of the ocean d) all of the above Answer: all of the above

Answer: Convergent margin

20. During a tsunami a series of waves radiating out ward from a central disturbance of the sea floor is called a

a. Ocean storm b. Wind-generated disturbance c. Wave train d. Wavelets

Answer: Wave train

21.When the stress exceeds the resistance to shearing along the locked interface between two converging plates, what will happen?

a. The seafloor will suddenly subside b. The seafloor will suddenly be driven upward c. The seafloor will slide passively in a lateral direction parallel to the strike of the interface d. Nothing will happen

Answer: The seafloor will suddenly be driven upwards

22. If the seafloor is suddenly displaced upward, then what happens to the sea surface?

a. It will subside b. It will remain unchanged

c. It will momentarily rise d. Nothing will happen Answer: It will momentarily rise.

23. Just prior to a tsunami coming ashore, sea level appears to fall quickly. This phenomenon is called

a. Sea level drop b. Draw fall c. Drawdown d. Dip in sea level Answer: Drawdown

24. As a tsunami approaches shallow water which of the following set of transformations occur?

a. Wavelength increases, wave period decreases, and wave height stays the same

b. Wavelength decreases, wave period decreases, and wave height increases

c. Wavelength decreases, wave period increases, and wave height increases

d. Wavelength decreases, waver period stays the same, and wave height increases

Answer: wavelength decreases, their periods remain constant, and their wave heights increase.

25. The wave height of a tsunami is typically less than

a. 0.1 m b. 0.2 m c. 1 m d. 0.5 m e. 0. 3 m

Answer: 1 m

26. What does "tsunami" mean in Japanese?

a. severe earthquake b. Huge wind c. Harbour wave d. Terrible storm Answer: Harbour wave

27. What are the three phases of disaster management planning?

Cyclone

I. Choose the Best Answer From Among the Given Alternatives:-

1. The name of cyclone in the north Indian ocean is_____.
   a) Typhoon b) Hurricane c) Severe cyclonic storm d) None of these
2. Length of Indian coast line is_____.
   a) 6500 Km Approx b) 7500 Km Approx c) 8500 Km approx d) None of these
3. Andhrapradesh is in_____.
   a) West coast b) East coast c) North India d) None of these
4. The state lies in west coast is_____.
   a) Karnataka b) Tamilnadu c) Andhra Pradesh d) West Bengal
5. The nodal department for wind detection IMD refers to
   a) Indian meteorological department b) Indian metrological department c) Indian metallurgical department d) None of these
6. Mapping method used for tracking wind speed and direction is
   a) Hazard mapping b) Mind mapping c) Speed mapping d) None of these
7. Percentage of Indian total area prone to cyclone is a) 6% b) 8% c) 10% d) 12%
8. ACWC refers to
   a) Area cyclone warning centre b) Asian cyclone warning centre c) Atlantic cyclone warning centre d) none of these
9. Increase in carbon dioxide in atmosphere causes
   (i) Rise in earth temperature (ii) fall in earth temperature (iii) Uniform earth temperature (iv) increase in ultraviolet rays
10. The doldrums is an area of
    (i) Low temperature (ii) low pressure (iii) low rainfall (iv) low humidity
11. An example of natural disaster is :
    i. Tsunami ii. Flood iii. Storm iv. All of these
12. Which of the following is most likely to be in the 'eye' of a cyclone?
    i. It is an area of high pressure ii. It is an area of low pressure iii. It has high speed winds iv. It has lots of clouds
13. In the earth atmosphere
    i. increase with height ii. Decreases with height iii. Remains constant with height iv. first increases and then decreases with height
14. Which of the following is the best thing to do during heavy lightning ?
    i. lie on the ground in an open place.
    ii. Go into a water body
    iii. Stay indoors, away from metallic doors and windows.
    iv. Stand under a tall tree.
15. The monsoon has well developed cycle in
    i. south and south east asia ii. North Australia iii. Africa iv. East united state
16. When wind speed increases, air pressure s
    (a) Increases (b) Decreases (c) remains constant (d) None of these

d. the pressure inside and outside the bottle same.

28. Warm air is_____than cold air
i. Heavier ii. lighter iii. no difference in weight iv. very much lighter

29. The centre of a cyclone is a calm area and is called the____of the storm.
a. eye b. Focus c. Centre d. Radius

30. A cyclone is called a_____in the American Continent.
a. Hurricane b. Typhoon c. Tornado d. Thunderstorm

31. A cyclone is called a_____in Philippines and Japan.
a. Hurricaneb. Typhoon c. Tornado d. Thunderstorm

c. vegetation in and around a river d. all of the above

7. Which of the following is an environmental consequence of floods?

a. dispersal of weed species b. erosion of soil

c. release of pollutants into waterways d. all of the above.

8. Which of the following is used to estimate which areas will be inundated during a flood, based on river height information?

a. satellite and radar images b. flood maps / floodplain hydraulic models

c. river gauging stations d. all of the above.

9. Which of the following statements is false?

a. weather forecasts for a small region are more accurate than those for a large region

b. weather forecasts are more accurate in Melbourne than in Darwin

c. forecasts of temperature are more accurate than forecasts of rainfall

d. all of the above

.10. Which of the following is true?

Flood warnings:

a. should not be released until the information is certain

b. should indicate what the threat is, what action should be taken, by whom and when

c. are best if they come from a single source

d. all of the above.

11. Flood risk refers to:

a. the chance of a flood occurring

b. the number of people and properties exposed to floodwaters if a flood occurs

c. the vulnerability of people and properties that are exposed to floodwaters

d. all of the above.

12. Which of the following can reduce the risk of flooding?

a. zonings and building regulations for new developments

b. dams, detention basins and levees

19. As the discharge in a stream increases, load usually _____.

a. increases b. decreases

c. stays the same d. none of the above

20. A stream with too much bed load will usually have what type of channel pattern?

a. straight b. meandering

c. braided d. dendritic

21. Which of the following is not a characteristic of a braided stream?

a. branching channels b. high gradient

c. abundant bed load d. constant discharge

22. Usually the largest floods in a stream occur _____.

a. very frequently, several times in one year b. frequently, every few years

c. rarely, about every ten years d. rarely, or once every few 100 years

23. If a dam is removed, then upstream from the former dam the river responds by

a. downcutting (lowering its bed) b. raising its bed

c. avulsion d. becoming a braided stream

e. decreasing its discharge f. making no change

24. Which of the following measurements is not needed to estimate stream discharge?

a. stream velocity b. width of stream

c. bed load of stream d. depth of stream

25. Which is not a characteristic of a regional flood?

a. An extended rise of river elevation for weeks to months.

b. Large storm systems or an extended period of rainfall.

c. A small drainage basin.

d. Floodplains covered with floodwaters.

26. Most of the damage done by floods in the U.S. occurs_____.

a. on floodplains b. in small tributaries c. in delta regions

d. on uplands along major rivers e. in deserts

a. very heavy rainfall b. hurricanes

c. ice dam failures d. meteorite impacts

34. In ancient Egypt the Nile River

a. destroyed large areas of farming land every year

b. had to be regulated because it carried too much water

c. brought nutrients that made the fields fertile

d. changed its course almost every year

35. The flooding of New Orleans in 2004 was caused by

a. an earthquake b. a tsunami

c. a hurricane d. a tornado

36. In alpine regions reservoirs are created

a. to regulate the flow of melting water from icefields

b. to give the alpine populations enough water

c. to make larger rivers smaller

d. to get enough water into the main rivers

37. Dikes and dams are lined up along the coast of the Netherlands

a. to generate electricity for its population

b. to change the course of rivers that flow into the North Sea

c. to keep storms away from the country

d. to keep ocean water out of the lower lying land

38. Flash floods are often caused

a. by thunderstorms b. dikes and dams that are too high

c. by rainfall over many days d. by river beds that are too high

39. Flooding in London is prevented by

a. a barrier that is raised and lowered b. gates in the western part of the city

c. westerly winds d. high dams along the Themes

40. When forests are cut or burned down

49. What causes most flash flooding?

a. Tornadoes.

b. Slow-moving thunderstorms, thunderstorms repeatedly moving over the same area, or heavy rains from hurricanes and tropical storms.

c. Hailstorms.

50. How many feet of fast-moving flood water can sweep a vehicle away?

a. 3 feet b. 2 feet c. 4

feet Answers:

1. c	6. d	11. d	16. d	21.d	26. a	31.b	36.a	41.b	46.d
2. d	7. d	12. d	17.b	22.d	27.d	32.d	37.d	42.d	47.a
3. c	8. b	13. a	18.a	23.a	28. b	33.c	38.a	43.c	48.c
4. d	9. a	14. c	19.a	24.c	29. b	34.c	39.a	44.d	49.b
5. c	10. b	15. d	20.c	25. c	30.a	35.c	40. a	45.a	50.b

a) 80 b) 68 c) 15 d) 25

12. Drought unequal distribution of food increased population and flooding are causes of
a) Typhoid b)dengue feverc) malaria d) famine

13. Situation in which there is no enough food in an area to feed people is called
a) Famine b) drought c)monsoon d)thunderstorms

14. Higher level of floods and droughts are led by
a) sand storms b)lower precipitation c) higher precipitation d) none of the above

15. Percentage of earth surface which is covered by oceans and seas is a) 50% b) 65% c) 85 % d) 97 %

16. Percentage of surface of earth is covered by water is a) 70% b)85 % c)90 % d)60 %

17. The grass is dry. the soil is dry
a)drought b) flood c) earthquake d) landslide

18. There has been little rain for months
a)drought b) cyclone c) earthquake d) landslide

19. We can't use to much water ,because we don,t have a lot of it
a) drought b) flood c) tsunami d) earthquake

20. The most catastrophic weather or climate related disasters in terms of lives lost are a)droughts b)severe stroms c)floods d)tornodus

21. What are the reason for causes of drought

a) Floods b) tsunami c) landslide d) excessive use of ground and surface water

22. Meteorological drought means
a) Simple absence/deficit of rainfall from the normal
b) Leads to reduction of natural stream flows or ground water levels
c) Level in soil is insufficient to maintain average crop yields
d) Correlates the supply and demand of goods and services

23. Severe Drought for identifying
a) Deficit of rainfall more than 50 per cent of normal.

b) Deficit of rainfall between 26-50 per cent of normal.

c) Deficiency of a particular year's rainfall exceeding 25 per cent of normal.

d) None of the above.

Landslide

1. The movement of earthy materials from higher region to lower region due to gravitational pull is called_____.
   a. Earth quake b. soil erosion c. landslide d. cyclone Ans:
   c. landslide
2. Downhill movement of earth is mainly caused by_____.
   a. Monsoon failure b. rain c. drought d. pollution. Ans:
   b. rain
3. Movement of heavy vehicles on the unstable sloppy region creates___.
   a. Earth quake b. flood c. volcano d. landslide. Ans:
   d. landslide
4. _____is the device which is used to detect landslides.
   a. Vibration sensor b. piezo electric crystal
   c. strain gauge d. proximity sensor. Ans:
   c. strain gauge
5. To prevent landslide, improving the cultivation in the sloppy region, the roots of which Provide___effect.
   a. Erosion b. coherent c. cohesion d. flood. Ans:
   c. cohesion
6. _____is a downward movement of wet soil along the slopes under the influence of gravity.
   a. Creep b. Lahars c. Debris flow d. Solification Ans:
   d. solification.
7. _____is extremely slow downward movement of dry surfacial matters.
   a. Lahars b. Creep c. Solification d. Debris flow Ans:
   b. creep.
8. _____is ash from a volcanic mixer with water to form a thick river of mud.
   a. Lahars b. Solification c. Debris flow d. Creep Ans:
   a. lahars.
9. A _____is the form of rapid mass movement of earthy matters.
   a. Solification b. Creep c. debris flow d. Lahars Ans:
   c. debris flow.
10. Movement of earthquake waves through the ground can produce_____.
    a. Solification b. Creep c. Liquefaction d. Lahars
    Ans: liquefaction.
11. Hotspot of landslide in India is_____.
    a. Himalayan valleys b. Sri lanka c. Indonesia d. All the above Ans:
    d. All the above
12. Land slide and can be defined as the_____of slope.
    a. Downward movement b. Upward movement
    c. Outward movement d. Downward and Outward movement
    Ans
    : d. downward and outward movement
13. The slope forming materials composed of _____.
    a. Rocks b. Soils c. Artifical fills d. All the above Ans:
    d. All the above
14. The land slide surfaces of separation by_____.

a.Urbanization b.localization c.deforestation

d.deplantation 29.All substances that are

major causes of pollution are classified as a.compounds

b.acids c.oxides d.pollutants

30. Ultraviolet rays in radiations of sun is absorbed by

a.troposphere b.thermosphere c.stratosphere d.ozone

R13

Code No: 126EC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, December - 2017

DISASTER MANAGEMENT

(Common to AE, AGE, AME, EEE, ECE, EIE, IT, MSNT, ME, MIE, PTM)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a)	What are the environmental hazards?	[2]
b)	What is ecosystem?	[3]
c)	Explain about chemical hazards.	[2]
d)	Define physical and biological Hazards.	[3]
e)	What is an earthquake?	[2]
f)	What are the causes of land slide? Explain.	[3]
g)	Define soil erosion.	[2]
h)	Define heat wave floods.	[3]
i)	Define disaster management.	[2]

NAWAB SHAH ALAM KHAN COLLEGE OF ENGINEERING & TECHNOLOGY

New Malakpet, Hyderabad-500 024

B.TECH STUDENT LIST OF IV YEAR I SEMESTER (A.Y. 2020 - 2021)

BRANCH: CIVIL

S.NO	H.T. NO	NAME OF STUDENT
1	17RT1A0103	
2	17RT1A0110	
3	17RT1A0116	
4	17RT1A0122	
5	17RT1A0125	
6	17RT1A0133	
7	17RT1A0138	
8	17RT1A0140	
9	17RT1A0141	
10	17RT1A0143	
11	17RT1A0144	
12	17RT1A0150	
13	17RT1A0151	
14	17RT1A0153	
15	17RT1A0154	
16	17RT1A0157	
17	17RT1A0168	
18	17RT1A0172	
19	17RT1A0174	
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29	17RT1A0199	
30	17RT1A01A0	
31	17RT1A01A1	
32	17RT1A01A2	
33	17RT1A01A3	
34	17RT1A01A7	
35	17RT1A01A8	
36	17RT1A01B0	
37	17RT1A01B5	
38	17RT1A01B6	

39	17RT1A01B8	
40	17RT1A01C0	
41	17RT1A01C3	
42	17RT1A01C4	
43	17RT1A01C5	
44	17RT1A01C6	
45	17RT1A01C7	
46	17RT1A01D1	
47	17RT1A01D2	
48	17RT1A01D5	
49	17RT1A01E2	
50	17RT1A01E7	
51	17RT1A01F0	
52	17RT1A01F5	
53	17RT1A01F6	
54	17RT1A01F8	
55	17RT1A01G0	
56	17RT1A01G1	
57	17RT1A01G2	
58	18RT5A0102	
59	18RT5A0104	
60	18RT5A0106	
61	18RT5A0107	
62	18RT5A0108	
63	18RT5A0109	
64	18RT5A0110	
65	18RT5A0111	
66	18RT5A0112	
67	18RT5A0113	
68	18RT5A0114	
69	18RT5A0115	

70	18RT5A0117	
71	18RT5A0118	
72	18RT5A0119	
73	18RT5A0120	
74	18RT5A0121	
75	18RT5A0123	
76	18RT5A0124	
77	18RT5A0125	
78	18RT5A0126	
79	18RT5A0127	
80	18RT5A0128	
81	18RT5A0129	
82	18RT5A0131	
83	18RT5A0132	
84	18RT5A0133	
85	18RT5A0134	
86	18RT5A0135	
87	18RT5A0136	
88	18RT5A0137	

HOD PRINCIPAL

Student List Advance Learner		
S.no	Roll Number	Marks
1	17RT1A0103	20
2	17RT1A0110	21
3	17RT1A0116	21
4	17RT1A0122	22
5	17RT1A0125	23
6	17RT1A0133	23
7	17RT1A0138	23
8	17RT1A0140	21
9	17RT1A0141	23
10	17RT1A0143	22
11	17RT1A0144	23
12	17RT1A0150	23
13	17RT1A0151	23
14	17RT1A0153	22
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22	17RT1A0182	23
23	17RT1A0183	23
24	17RT1A0184	22
25	17RT1A0187	23
26	17RT1A0189	22
27	17RT1A0190	23
28	17RT1A0197	21
29	17RT1A0199	23
30	17RT1A01A0	21
31	17RT1A01A1	20
32	17RT1A01A2	22
33	17RT1A01A3	23
34	17RT1A01A7	23
35	17RT1A01A8	21
36	17RT1A01B0	21
37	17RT1A01B5	20
38	17RT1A01B6	22
39	17RT1A01B8	23
40	17RT1A01C0	23
41	17RT1A01C3	21
42	17RT1A01C4	20

43	17RT1A01C5	22
44	17RT1A01C6	23
45	17RT1A01C7	23
46	17RT1A01D1	23
47	17RT1A01D2	23
48	17RT1A01D5	21
49	17RT1A01E2	21
50	17RT1A01E7	20
51	17RT1A01F0	22
52	17RT1A01F5	23
53	17RT1A01F6	23
54	17RT1A01F8	23
55	17RT1A01G0	21
56	17RT1A01G1	20
57	17RT1A01G2	23
58	18RT5A0102	23
59	18RT5A0104	22
60	18RT5A0106	22
61	18RT5A0107	23
62	18RT5A0108	21
63	18RT5A0109	20
64	18RT5A0110	23
65	18RT5A0111	20
66	18RT5A0112	22
67	18RT5A0113	21
68	18RT5A0114	23
69	18RT5A0115	22
70	18RT5A0117	22
71	18RT5A0118	22
72	18RT5A0119	23
73	18RT5A0120	21
74	18RT5A0121	21
75	18RT5A0123	23
76	18RT5A0124	23
77	18RT5A0125	21
78	18RT5A0126	22
79	18RT5A0127	22
80	18RT5A0128	22
81	18RT5A0129	23
82	18RT5A0131	23

NAWAB SHAH ALAM KHAN COLLEGE OF ENGINEERING AND TECHNOLOGY, OSMANIA UNIVERSITY, Hyderabad
DEPARTMENT OF CIVIL ENGINEERING

B.E. I YEAR, I/II SEM - **ATTAINMENT CALCULATIONS** - Academic Year: **2020-21**

Subject: DISASTER MANAGEMENT **Subject Code:** 138FW **Faculty:** MOHD TOUFEEQ

S.No.	Hall Ticket No.	MID-1										Mid-1 TOTAL (25 M)	MID-2										Mid-2 TOTAL (25 M)	MID Average MID (25 M)	TOTAL Marks (100 M)	SEE End Exam (75 M)
		ASG-1 (2.5M)	ASG-2 (2.5 M)	Quiz-1 (20 M)									ASG-3 (2.5M)	ASG-4 (2.5 M)	Quiz-2 (10 M)		Q 1 (5 M)	Q 2 (5 M)	BEST OF Q1&Q2	Q 3 (5 M)	Q 4 (5 M)	BEST OF Q3&Q4				
		CO1	CO2	CO1	CO2								CO3	CO4	CO3	CO4	CO3	CO3	CO3	CO4	CO4	CO4				
1	17RT1A0103	2.5	2.5	8	7							20	2.5	2.5	5		3	3	3	4	4	4	17	19	76	58
2	17RT1A0110	2.5	2.5	8	8							21	2.5	2.5	5	5		5	5		4	4	24	23	52	30
3	17RT1A0116	2.5	2.5	8	8							21	2.5	2.5	5		3	3	3	4	4	4	17	19	76	57
4	17RT1A0122	2.5	2.5	9	8							22	2.5	2.5	5	5		5	5	4	4	4	24	23	50	27
5	17RT1A0125	2.5	2.5	9	9							23	2.5	2.5	5		5	5	5		4	4	19	21	76	55
6	17RT1A0133	2.5	2.5	9	9							23	2.5	2.5	5		5	5	5		4	4	19	21	51	30
7	17RT1A0138	2.5	2.5	9	9							23	2.5	2.5	5	5		5	5	4	4	4	24	24	76	53
8	17RT1A0140	2.5	2.5	8	8							21	2.5	2.5	5		4	4	4		4	4	18	20	68	49
9	17RT1A0141	2.5	2.5	9	9							23	2.5	2.5	5		4	4	4		5	5	19	21	75	54
10	17RT1A0143	2.5	2.5	9	8							22	2.5	2.5	5	5		5	5	4	4	4	24	23	68	45
11	17RT1A0144	2.5	2.5	9	9							23	2.5	2.5	5		5	5	5		4	4	19	21	80	59
12	17RT1A0150	2.5	2.5	9	9							23	2.5	2.5	5	4		4	4	4	4	4	22	23	66	44
13	17RT1A0151	2.5	2.5	9	9							23	2.5	2.5	5		4	4	4		4	4	18	21	75	55
14	17RT1A0153	2.5	2.5	9	8							22	2.5	2.5	5		4	4	4		5	5	19	21	74	54
15	17RT1A0154	2.5	2.5	8	8							21	2.5	2.5	5	4		4	4	4	4	4	22	22	73	52
16	17RT1A0157	2.5	2.5	8	7							20	2.5	2.5	5		4	4	4		3	3	17	19	50	32
17	17RT1A0168	2.5	2.5	9	9							23	2.5	2.5	5		4	4	4		3	3	17	20	51	31
18	17RT1A0172	2.5	2.5	8	8							21	2.5	2.5	5	4		4	4	4	4	4	22	22	75	54
19	17RT1A0174	2.5	2.5	8	7							20	2.5	2.5	5	3		3	3	4	4	4	20	20	75	55
20	17RT1A0177	2.5	2.5	8	8							21	2.5	2.5	5	3		3	3		4	4	20	21	51	31
21	17RT1A0181	2.5	2.5	9	8							22	2.5	2.5	5		5	5	5		4	4	19	21	75	55
22	17RT1A0182	2.5	2.5	9	9							23	2.5	2.5	5		4	4	4		4	4	18	21	68	48
23	17RT1A0183	2.5	2.5	9	9							23	2.5	2.5	5	4		4	4	4	4	4	22	23	68	46
24	17RT1A0184	2.5	2.5	9	8							22	2.5	2.5	5	4		4	4		5	5	23	23	74	52
25	17RT1A0187	2.5	2.5	9	9							23	2.5	2.5	5	4		4	4	4	4	4	22	23	68	46
26	17RT1A0189	2.5	2.5	9	8							22	2.5	2.5	5		5	5	5		4	4	19	21	74	54
27	17RT1A0190	2.5	2.5	9	9							23	2.5	2.5	5		4	4	4		4	4	18	21	49	29
28	17RT1A0197	2.5	2.5	8	8							21	2.5	2.5	5		4	4	4	4	4	4	18	20	51	32
29	17RT1A0199	2.5	2.5	9	9							23	2.5	2.5	5	4		4	4		4	4	22	23	76	54
30	17RT1A01A0	2.5	2.5	8	8							21	2.5	2.5	5		3	3	3	4	4	4	17	19	69	50
31	17RT1A01A1	2.5	2.5	8	7							20	2.5	2.5	5		3	3	3	3	3	3	16	18	74	56
32	17RT1A01A2	2.5	2.5	9	8							22	2.5	2.5	5	5		5	5		3	3	23	23	50	28
33	17RT1A01A3	2.5	2.5	9	9							23	2.5	2.5	5		4	4	4		5	5	19	21	49	28
34	17RT1A01A7	2.5	2.5	9	9							23	2.5	2.5	5	5		5	5	4	4	4	24	24	51	28
35	17RT1A01A8	2.5	2.5	8	8							21	2.5	2.5	5		4	4	4	3	3	3	17	19	52	33
36	17RT1A01B0	2.5	2.5	8	8							21	2.5	2.5	5	5		5	5		2	2	22	22	76	55
37	17RT1A01B5	2.5	2.5	8	7							20	2.5	2.5	5		4	4	4		2	2	16	18	50	32
38	17RT1A0186	2.5	2.5	9	8							22	2.5	2.5	5		4	4	4	4	4	4	18	20	73	53
39	17RT1A01B8	2.5	2.5	9	9							23	2.5	2.5	5	5		5	5		4	4	24	24	51	28

40	17RT1A01C0	2.5	2.5	9	9							23	2.5	2.5	5		4	4	4	5	5	5	19	21	52	31
41	17RT1A01C3	2.5	2.5	8	8							21	2.5	2.5	5	4		4	4		3	3	21	21	52	31
42	17RT1A01C4	2.5	2.5	8	7							20	2.5	2.5	5	4		4	4		2	2	20	20	51	31
43	17RT1A01C5	2.5	2.5	9	8							22	2.5	2.5	5	4		4	4	4	4	4	22	22	69	47
44	17RT1A01C6	2.5	2.5	9	9							23	2.5	2.5	5		4	4	4		5	5	19	21	75	54
45	17RT1A01C7	2.5	2.5	9	9							23	2.5	2.5	5	5		5	5	4	4	4	24	24	74	51
46	17RT1A01D1	2.5	2.5	9	9							23	2.5	2.5	5		4	4	4		4	4	18	21	49	29
47	17RT1A01D2	2.5	2.5	9	9							23	2.5	2.5	5	5		5	5		4	4	24	24	75	52
48	17RT1A01D5	2.5	2.5	8	8							21	2.5	2.5	5		4	4	4	5	5	5	19	20	76	56
49	17RT1A01E2	2.5	2.5	8	8							21	2.5	2.5	5		4	4	4		3	3	17	19	76	57
50	17RT1A01E7	2.5	2.5	8	7							20	2.5	2.5	5	2		2	2	4	4	4	18	19	76	57
51	17RT1A01F0	2.5	2.5	9	8							22	2.5	2.5	5		4	4	4		4	4	18	20	74	54
52	17RT1A01F5	2.5	2.5	9	9							23	2.5	2.5	5	5		5	5	4	4	4	24	24	73	50
53	17RT1A01F6	2.5	2.5	9	9							23	2.5	2.5	5	5		5	5		4	4	24	24	52	29
54	17RT1A01F8	2.5	2.5	9	9							23	2.5	2.5	5		5	5	5		4	4	19	21	74	53
55	17RT1A01G0	2.5	2.5	8	8							21	2.5	2.5	5		3	3	3	4	4	4	17	19	76	57
56	17RT1A01G1	2.5	2.5	8	7							20	2.5	2.5	5	3		3	3		3	3	19	20	68	49
57	17RT1A01G2	2.5	2.5	9	9							23	2.5	2.5	5		5	5	5		4	4	19	21	75	54
58	18RT5A0102	2.5	2.5	9	9							23	2.5	2.5	5	4		4	4	5	5	5	23	23	74	51
59	18RT5A0104	2.5	2.5	9	8							22	2.5	2.5	5		5	5	5	4	4	4	19	21	79	59
60	18RT5A0106	2.5	2.5	9	8							22	2.5	2.5	5		4	4	4		5	5	19	21	76	56
61	18RT5A0107	2.5	2.5	9	9							23	2.5	2.5	5	4		4	4	5	5	5	23	23	49	26
62	18RT5A0108	2.5	2.5	8	8							21	2.5	2.5	5		4	4	4	3	3	3	17	19	75	56
63	18RT5A0109	2.5	2.5	8	7							20	2.5	2.5	5	3		3	3		3	3	19	20	74	55
64	18RT5A0110	2.5	2.5	9	9							23	2.5	2.5	5		4	4	4		5	5	19	21	52	31
65	18RT5A0111	2.5	2.5	8	7							20	2.5	2.5	5		3	3	3	3	3	3	16	18	51	33
66	18RT5A0112	2.5	2.5	9	8							22	2.5	2.5	5	4		4	4		4	4	22	22	75	53
67	18RT5A0113	2.5	2.5	8	8							21	2.5	2.5	5		4	4	4		3	3	17	19	75	56
68	18RT5A0114	2.5	2.5	9	9							23	2.5	2.5	5	5		5	5	4	4	4	24	24	52	29
69	18RT5A0115	2.5	2.5	9	8							22	2.5	2.5	5		4	4	4	4	4	4	18	20	50	30
70	18RT5A0117	2.5	2.5	9	8							22	2.5	2.5	5	4		4	4		4	4	22	22	50	28
71	18RT5A0118	2.5	2.5	9	8							22	2.5	2.5	5		4	4	4		4	4	18	20	76	56
72	18RT5A0119	2.5	2.5	9	9							23	2.5	2.5	5		4	4	4	5	5	5	19	21	52	31
73	18RT5A0120	2.5	2.5	8	8							21	2.5	2.5	5	4		4	4	3	3	3	21	21	50	29
74	18RT5A0121	2.5	2.5	8	8							21	2.5	2.5	5		4	4	4		3	3	17	19	75	56
75	18RT5A0123	2.5	2.5	9	9							23	2.5	2.5	5	5		5	5	4	4	4	24	24	51	28
76	18RT5A0124	2.5	2.5	9	9							23	2.5	2.5	5	5		5	5		4	4	24	24	75	52
77	18RT5A0125	2.5	2.5	8	8							21	2.5	2.5	5		4	4	4	3	3	3	17	19	69	50
78	18RT5A0126	2.5	2.5	9	8							22	2.5	2.5	5		4	4	4	4	4	4	18	20	69	49
79	18RT5A0127	2.5	2.5	9	8							22	2.5	2.5	5	4		4	4		4	4	22	22	76	54
80	18RT5A0128	2.5	2.5	9	8							22	2.5	2.5	5		4	4	4	4	4	4	18	20	74	54
81	18RT5A0129	2.5	2.5	9	9							23	2.5	2.5	5	5		5	5		4	4	24	24	73	50
82	18RT5A0131	2.5	2.5	9	9							23	2.5	2.5	5		5	5	5		4	4	19	21	52	31
83	18RT5A0132	2.5	2.5	9	9							23	2.5	2.5	5	4		4	4	5	5	5	23	23	76	53
84	18RT5A0133	2.5	2.5	8	8							21	2.5	2.5	5		3	3	3	4	4	4	17	19	76	57
85	18RT5A0134	2.5	2.5	8	7							20	2.5	2.5	5		3	3	3	3	3	3	16	18	73	55
86	18RT5A0135	2.5	2.5	9	9							23	2.5	2.5	5		5	5	5		4	4	19	21	76	55
87	18RT5A0136	2.5	2.5	9	9							23	2.5	2.5	5	5		5	5	4	4	4	24	24	52	29
88	18RT5A0137	2.5	2.5	9	9							23	2.5	2.5	5		5	5	5	4	4	4	19	21	52	31
Average Marks		**2.50**	**2.50**	**8.65**	**8.31**							**21.95**	**2.50**	**2.50**	**5.00**	**4.28**	**4.06**	**4.16**	**4.16**	**3.98**	**3.90**	**3.90**	**19.95**	**20.95**	**65.70**	**59.67**

CIE (Mid Exam) CO Wise Percentage

COURSE OUTCOME	CO Wise Sum	CO Wise Percentage %
CO1	11.15	89.18
CO2	10.81	86.45
CO3	11.66	93.27
CO4	10.68	85.44
Average	11.07	88.59

CIE - CO Wise Sum Formula

CO1 = ASG(CO1) + Q1(CO1) + BestOfQ2&Q3(CO1)
CO2 = ASG(CO2) + Q1(CO2) + BestOfQ4&Q5(CO2)
CO3 = ASG(CO3) + Q1(CO3) + BestOfQ2&Q3(CO3)
CO4 = ASG(CO4) + Q1(CO4) + BestOfQ4&Q5(CO4)

CIE - CO Wise Percentage

CO1 % = {CO1 SUM/total CO1 Marks(12.5)}*100
CO2 % = {CO2 SUM/total CO2 Marks(12.5)}*100
CO3 % = {CO3 SUM/total CO3 Marks(12.5)}*100
CO4 % = {CO4 SUM/total CO4 Marks(12.5)}*100

Average Marks	59.67
Student Count >Avg	88
Total Students	88
Percentage	100

SEE (End Exam) CO Wise Percentage

CO1-CO4	59.67	100.00

SEE - CO Wise Percentage

CO1-CO4 = End Exam Avg Marks

SEE - CO Wise Percentage

CO1-CO4 % = (End Exam Avg Marks/75)*100

CO ATTAINMENT	Internal Marks %	Internal Attainment	External Marks %	External Attainment	DIRECT ATTAINMENT LEVEL
CO1	89	3	100.00	3	3
CO2	86	3	100.00	3	3
CO3	93	3	100.00	3	3
CO4	85	3	100.00	3	3
Average					3.00

INTERNAL EXAM ATTAINMENT LEVEL SCALE

Attainment Levels	0	<=49
	1	50-64
	2	65-79
	3	>=80

EXTERNAL EXAM / FINAL ATTAINMENT LEVEL SCALE

Attainment Levels	0	<=39
	1	40-49
	2	50-59
	3	>=60

Direct Attainment %

CO1=(CO1IntAtn*0.25+CO1ExtAtn*0.75)
CO2=(CO2IntAtn*0.25+CO2ExtAtn*0.75)
CO3=(CO3IntAtn*0.25+CO3ExtAtn*0.75)
CO4=(CO4IntAtn*0.25+CO4ExtAtn*0.75)

CO-PO Matrix

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2		Attainment
CO1	1	1											1	1		3
CO2			2										1	1		3
CO3	1	1		1									2	2		3
CO4			2	1									2			3
Average	1	1	2	1	0	0	0	0	0	0	0	0	1.5	1.3333		3

Final Attainment %

CO1 = (DIRECT ATTAINMENT*0.8) + (INDIRECT ATTAINMENT*0.2)
CO2 = (DIRECT ATTAINMENT*0.8) + (INDIRECT ATTAINMENT*0.2)
CO3 = (DIRECT ATTAINMENT*0.8) + (INDIRECT ATTAINMENT*0.2)
CO4 = (DIRECT ATTAINMENT*0.8) + (INDIRECT ATTAINMENT*0.2)

Course PO Attainments

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
Direct Attainment	1	1	2	1	0	0	0	0	0	0	0	0	1.5	1.3333	

PO ATTAINMENTS

DIRECT ATTAINMENT (PO1)= (Average of PO1*Average of CO Direct Attainment)/3
Similar for PO2 TO PO12 & PSO1 TO PSO3