Assignment Booklet

MSCRWEE Programme
M.Sc (Renewable Energy and Environment)

Third Semester / Fourth Semester (Electives)	
MRWE-001	Nano Technology in Energy & Environment
MRWE-002	Energy Storage
MEV-021	Introduction to Climate Change
MEVE-001	Environmental Impact Assessment for Environmental Health
MCS-224	Artificial Intelligence and Machine Learning
MCS-226	Data Science and Big Data
MCS-227	Cloud Computing and IoT
MCS-231	Mobile Computing

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THE PEOPLE'S UNIVERSITY

SCHOOL OF ENGINEERING & TECHNOLOGY
INDIRA GANDHI NATIONAL OPEN UNIVERSITY
Maidan Garhi, New Delhi – 110 068

January 2024

Dear Student,

Please read the information on assignments in the Programme Guide that we have sent you after your enrolment. A weightage of 30%, as you are aware, has been earmarked for continuous evaluation, **which would consist of one tutor-marked assignment** for this Programme. The assignment for MSCRWEE (Third semester / fourth semester) has been given in this booklet.

Instructions for Formatting Your Assignments

Before attempting the assignment, please read the following instructions carefully:

1) On top of the first page of your answer sheet, please write the details exactly in the following format:

ENROLLMENT NO :……………………….……………

NAME :……………………………………………

ADDRESS :……………………………………………

……………………………………………

……………………………………………

PROGRAMME CODE: ………………………..

COURSE CODE: ………………………….

COURSE TITLE: ……………………………

STUDY CENTRE: …………………..…….   DATE: …………….………………...

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

2) Use only foolscap size writing paper (but not of very thin variety) for writing your answers.

3) Leave 4 cm margin on the left, top and bottom of your answer sheet.

4) Your answers should be precise.

5) **These assignments submitted should be hand written in your own hand writing.**

We strongly suggest that you should retain a copy of your answer sheets.

6) **You cannot fill the Exam Form without** submission of the assignments. So solve it and **submit it at the earliest.** If you wish to appear in the **TEE, June 2024,** you should submit your TMAs by **April 30, 2024.** Similarly, if you wish to appear in the **TEE, December 2024,** you should submit your TMAs by **September 30, 2024.**

7) Assignments will be submitted at **your respective regional centre.**

We wish you good luck!

ELECTIVE ASSIGNMENTS

(Attempt the assignment of the elective subject for which you are registered)

Course Code: MRWE-001
Course Title: Nano Technology in Energy & Environment
Assignment Code: MRWE-001/TMA/2024
Maximum Marks: 100

Last Date of Submission: April 30, 2024 (For June TEE), September 30, 2024 (For December TEE)
Note:

1.   **For any question worth 5 marks the word limit is 200 words, for a 10 mark question it is 350 words.**

2.   **All questions are compulsory. All questions carry equal marks.**

Q.1	a)	Define Nano-Technology. Explain the basic concepts of Nano-Technology.	5
	b)	Describe Nano Size and Nano Seale with suitable examples.	5
Q.2	a)	What are techniques used in Nano Technology? Explain any one.	5
	b)	What is synthesis of Nano Materials? Also describe the various properties of Nano Materials.	5
Q.3	a)	Discuss top-down and bottom-up approach with suitable sketch and list out the various methods of top-down and bottom-up approach.	5
	b)	What is Nano bot? List out the various applications of Nano bot.	5
Q.4	a)	Explain the working of Scanning Electron Microscopy (SEM) with suitable diagram. List outs its advantages and applications.	5
	b)	Difference between SEM and TEM.	5
Q.5	a)	How do you apply or use Nano Technology into energy sector? Explain in brief.	5
	b)	What is Energy Conversion Process? Explain single stage and multistage energy conversion process.	5
Q.6	a)	Explain briefly how Nano-Technology could be applied in Solar Energy.	5
	b)	What do you understand about Micro Electro Mechanical Systems (MEMS) and Nano Electro Mechanical Systems (NEMS)? Explain and list out its application.	5
Q.7	a)	Explain the working of Hydrogen Storage System with suitable diagram.	5
	b)	How Green Nano Technology could be developed? Explain with steps by step procedure.	5
Q.8	a)	Explain Nano-Micro Silicon (Si) composite structure and what are the various technologies used in silicon (Si) deposition.	5
	b)	How do you monitor the various environmental factors by using sensors?	5
Q.9	a)	How do you prevent the pollution by using Nano Technology? Explain with	5

suitable examples.

b) Discuss the various applications of Nano Technology in Environment. 5

Q.10   Write short notes of the following:
a) Carbon Nano Tubes 5
b) Green Nano Material 5
c) Pollution Abatement 5
d) Nano Sensor 5

Note:

1. For any question worth 5 marks the word limit is 200 words, for a 10 mark question it is 350 words.

2. All questions are compulsory. All questions carry equal marks.

Q.1 What are the challenges and opportunities associated with integrating energy storage systems into the electrical grid? 10

Q.2 Explain the design considerations for a flywheel rotor, including material selection, shape, and balancing techniques. Discuss the factors that affect the maximum achievable energy storage capacity. 10

Q.3 Discuss the concept of redox flow batteries and their advantages over other battery technologies. 10

Q.4 Discuss the safety aspects associated with hydrogen energy storage. Explain the measures, regulations, and best practices implemented to ensure safe storage, handling, and transportation of hydrogen. 10

Q.5 a) Compare different fuel cells based upon efficiency, operating temperature and fuel used. 05

   b) What are the main components of a fuel cell? How does a fuel cell generate electricity? 05

Q.6 What are the factors need to be considered while designing PCM? What are the different applications of PCM? 10

Q.7 Explain the innovative strategies used for Thermal Solar Energy Storage in buildings to achieve 3E goals. 10

Q.8 Compare and contrast the capital costs and operational costs of pumped-storage hydroelectricity and lithium-ion battery storage systems. What factors contribute to the cost differences between these two technologies? 10

Q.9 Discuss the economic viability of implementing sensible heat storage systems in different sectors. Analyze the factors that influence the cost- effectiveness and return on investment of such systems, considering both the initial capital costs and long-term operational benefits. 10

Q.10 a) What are the challenges or limitations associated with implementing LHTES systems? 05

   b) Provide examples of real-world applications or case studies where LHTES systems have been successfully implemented. 05

Assignment -3
(To be done **after** studying the course material)

Course Code: MEV-021
Course Title: Introduction to Climate Change
Assignment Code: MEV-021/TMA/2024
Maximum Marks: 100

Last Date of Submission: April 30, 2024 (For June TEE), September 30, 2024 (For December TEE)
Note:

1.   **For any question worth 10 marks the word limit is 350 words, for a 20 mark question it is 550 words.**

2.   **Attempt ANY FIVE questions. All questions carry equal marks.**

Q.1   Write short notes on the following: 20

     a. Radiative Forcing

     b. "Cloud feedback" and "Lapse-rate feedback"

Q.2   Explain the features of the Paris Agreement on Climate Change.   20

Q.3   Explain the National Action Plan on Climate change.   20

Q.4   Write short notes on the following: 20
     a. Representative Concentration Pathway
     b. General Circulation Models

Q.5   Explain the sources of palaeoclimatic data.   20

Q.6   Explain the natural drivers of climate change.   20

Assignment -4
(To be done **after** studying the course material)
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Course Code: MEVE-001
Course Title: Environmental Impact Assessment for
Environmental Health
Assignment Code: MEVE-001/TMA/2024
Maximum Marks: 100
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Last Date of Submission: April 30, 2024 (For June TEE), September 30, 2024 (For December TEE)
Note:

1. **For any question worth 10 marks the word limit is 350 words, for a 20 mark question it is 550 words.**

2. **Attempt ANY FIVE questions. All questions carry equal marks.**

Q.1	Explain the basic principles of EIA?	20
Q.2	Describe the Environmental Auditing process	20
Q.3	What is the Strategic Environmental Assessment? Explain its process.	20
Q.4	Explain in detail about Cost Benefit Analysis?	20
Q.5	When can the public be involved in the EIA? What is the importance of public consultation during the EIA?	20
Q.6	What are the objectives and types of energy audit? Explain in detail.	20
Q.7	Give a brief account on EIA laws and guidelines.	20

Assignment -5
(To be done **after** studying the course material)

Note:

1. For any question worth 10 marks the word limit is 350 words, for a 20 mark question it is 550 words.

2. Attempt all questions. All questions carry equal marks.

Q.1   Differentiate among Descriptive, Predictive and Prescriptive analytics performed under Machine Learning.   10

Q.2   What are Intelligent agents in AI? Briefly discuss the properties of Agents   10

Q.3   Find the minimum cost path for the 8-puzzle problem, where the start and goal state are given as follows: 10
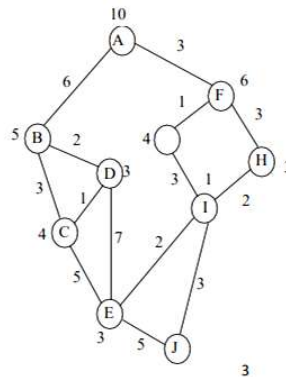
1	2	3
4	8	-
7	6	5

Start State

1	4	7
2	8	6
3	-	5

Goal State

Q.4   Consider the following graph. The numbers written on edges represents the distance between the nodes and the numbers written on nodes represents the heuristic value. Find the most cost effective path to reach from Noda A to node J using A* Algorithm   10

Q.5   Discuss the transforming an FOPL Formula into Prenex Normal Form with suitable example. Also, discuss Skolomization with a suitable example.   10

Q.6   Explain Forward Chaining Systems and Backward Chaining Systems with a suitable example for each.   10

Q.7 Draw a semantic network for the following English statement: Shyam struck   10
Neha and Neha's father struck Shyam

Q.8 Write short notes on following   10

a) Reinforcement Learning

b) Ensemble method

Q.9 Explain working of Back Propagation and Convolution Neural Network.   10

Q.10 For the given points of two classes red and blue: 10

Blue: { (1, 2), (2,1), (1,-2), (2,-2)}

Red : { (4,-1), (4,1), (5,-1), (6,1)}

Plot a graph for the red and blue categories. Find the support vectors and optimal separating line.

Note:

1. For any question worth 10 marks the word limit is 350 words, for a 20 mark question it is 550 words.

2. Attempt all questions. All questions carry equal marks.

Q.1 Describe data science. What uses does it have? In the context of data analysis, define the terms descriptive, exploratory, and predictive. — 10

Q.2 A class has 25 students. Create a data set of marks of the students in Mathematics out of a maximum of 50 marks. Discuss and draw, which chart will be best for Visualization & Interpretation. Justify your reasons in support of your answer. — 10

Q.3 What is the purpose of using Apache SPARK, HIVE and HBASE, explain with supporting example. — 10

Q.4 Create a sample data of the marks of 20 students in five different subjects using MS-Excel. Discuss the different chart and graphing library packages supported by R programming language. Write programs using R programming language to create four different plots using this data. — 10

Q.5 What is PageRank? Discuss the basic principle of flow model in PageRank. Explain different mechanisms of finding pagerank? — 10

Q.6 Discuss different data structures in R. Write program using R for the following tasks: (i) Computation of income tax of a vector of size 10, consisting of the total annual income of 10 different persons. The tax computation should be 10%, if annual income is below 5 lakhs and 20% if it is above 5 lakhs. (ii) Matrix addition, subtraction and multiplication (iii) Finding inverse of a matrix — 10

Q.7 Discuss the need for Statistical Hypothesis Testing with the help of an example. Explain types of Errors in Hypothesis Testing. — 10

Q.8 Discuss the Classification, Clustering and Association Rules with different 10
examples. Explain, where we can use Random Forest Algorithm? Use R
programming language to discuss Random Forest Algorithm.

Q.9 What is NoSQL database? Discuss how does a Column Database and Document 10
database Work? List and briefly discuss Graph database examples.

Q.10 Explain the process and issues of the following: Advertising on web, 10
Recommendation system, Mining of social networks.

Note:

1. **For any question worth 10 marks the word limit is 350 words, for a 20 mark question it is 550 words.**

2. **Attempt all questions. All questions carry equal marks.**

Q.1   Explain the term Resource Provisioning in context of cloud computing. Also,   20
explain the various approaches used for Resource Provisioning. Discuss the
problems of Over-provisioning and Under provisioning.

Q.2   Explain the following types of network connectivity in cloud computing: 20

1. Public Inter cloud Networking

2. Private Inter cloud Networking

3. Public Intra cloud Networking

4. Private Intra cloud Networking

Q.3   What is Edge computing? Discuss the working of Edge computing. Also,   20
describe the relation between Edge computing, Fog computing and Cloud
Computing, with the help of a suitable block diagram?

Q.4   What is Tenancy in context of cloud computing? Compare Multi-Tenancy   20
model and Single Tenancy model of resource sharing. Explain the various
ways through which Multi-Tenancy can be implemented.

Q.5   Explain the term Internet of Things (IoT).List and explain the various   20
components used to implement IoT. Give characteristics of IoT. Briefly
discuss the following types of IoT:

1. Consumer IoT (CIoT)

2. Industrial IoT(IIoT)

3. Infrastructure IoT

4. Internet of Military Things (IoMT)

Note:

1.   **For any question worth 20 marks the word limit is 550 words, for a 25 mark question it is 650 words.**

2.   **Attempt all questions. All questions carry equal marks.**

Q.1   What are the advantages and disadvantages of 5G networks in comparison to 4G   20
      networks

Q.2   Explain .NET framework. Compare it with any other framework   20

Q.3   Explain the working of Mobile IP.   20

Q.4   What are the latest versions of Windows and iOS operating systems? What are   20
      the differences between the latest and earlier versions?

Q.5   What is meant by Multiplexing? How does TDMA differ from FDMA?   20