R7328	Sub. Code
	540301

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

Third Semester

Energy Science

HYDROGEN ENERGY SYSTEMS

(CBCS – 2019 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What is water gas shift reaction?

2. Give any two projected uses of hydrogen

3. How is hydrogen used as biomass fuel?

4. What is meant by autothermal gasification?

5. Define electrolyzer. How is it used in water splitting process?

6. What is the challenge occurred in Photoelectrochemical (PEC) water splitting?

7. How are fuel cells classified?

8. What is fuel cell? Is a fuel cell safe?

9. What is clathrate hydrates?

10. What are physical and chemical storages of hydrogen gas?

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Comment on Hydrogen as fuel for the future.

Or

(b) Explain the principle and working of membrane reactors.

12. (a) Explain the production of hydrogen from photobiogical method.

Or

(b) Explain the role of sulphur in the production of hydrogen.

13. (a) Write a note on direct hydrogen production.

Or

(b) Explain the working of photovoltaic cell.

14. (a) Write short notes on direct methanol fuel cell.

Or

(b) Illustrate the principle and working of acid fuel cell.

15. (a) Discuss the hydrogen storage by chemical method using amine complexes.

Or

(b) Write a note on stationary hydrogen storage.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) What are membranes? How are they classified? How is it used in gas separation process?

(b) Discuss the characteristics of steam reforming process. (5+5)

17. Describe the different biochemical pathways of production of hydrogen.

18. With a neat diagram, explain the construction and working of photo-electrochemical cells.

19. (a) What are the main benefits of direct borohydride fuel cell?

    (b) Discuss the applications of fuel cells. (5+5)

20. Discuss the various chemical storages of hydrogen.

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R7329	Sub. Code
	540302

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

Third Semester

Energy Science

WIND AND HYDRO ENERGY

(CBCS – 2019 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** the questions.

1. Define wind energy.

2. What is meant by Coriolis force?

3. What are the advantages of Onshore wind turbines over offshore wind turbines?

4. What are the disadvantages of wind energy system?

5. Where are the hydropower plants located?

6. Name any four major Hydro Power Plants (producing more than 100 MW) in India.

7. What are the branches of hydrology?

8. What are the advantages of tidal energy?

9. Mention the uses of Surge tank.

10. Write any four parameters to improve the power efficiency using design documents.

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Write a note on cube of wind energy.

Or

(b) What is air density? How does it vary with humidity and pressure?

12. (a) Write a note on wind power markets.

Or

(b) What is grid in wind energy? How do wind turbine connected to the grid? Explain.

13. (a) Explain the layout and working of mini hydro electric systems.

Or

(b) How is hydropower system classified? Explain with suitable diagram.

14. (a) How is available power calculated from Hydro power plants?

Or

(b) Write a note on Ocean current power plants.

15. (a) Illustrate the cost model of designing power plant.

Or

(b) What are the essential elements of hydro electric power plant?

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Explain the different types of propellers.

(b) Discuss the relationship between wind turbine blade efficiency and power. (5+5)

17. (a) Illustrate the ecological ill-effect of wind energy system.

(b) Discuss the planning and commissioning of wind farm designing. (4+6)

18. Describe the status of hydro electric systems in India and world wide.

19. Discuss the outlook and development potential of hydro electric power systems.

20. (a) Write a note on potential of hydro power in north east India.

(b) Explain the procedures involved to select the site for hydro power system. (5+5)

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R7330	Sub. Code
	540303

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

Third Semester

Energy Science

SOLAR THERMAL ENERGY

(CBCS – 2019 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** the questions.

1. How do you calculate solar insolation?

2. What is solar radiation? How much solar radiation reaches the earth?

3. What are the different thermodynamic cycles?

4. What are the four process of Carnot cycle?

5. What is solar collector? Which solar collector is more efficient?

6. What are the important aspects of solar collector system?

7. What is solar thermal system? Mention their types.

8. Define solar drying.

9. Can solar power heat your home?

10. Do solar water heaters work on cloudy days?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Using a neat diagram, explain the working of pyranometer.

Or

(b) Explain the principle underlying the measuring of scattering radiation.

12. (a) Write a note on Brayton cycle.

Or

(b) Explain the working of solar thermal power plant.

13. (a) Distinguish between Solar Panels and Solar Collectors.

Or

(b) Explain the working of Flat plate collectors.

14. (a) What is the principle of active solar heating? How does it differ from passive solar heating?

Or

(b) Write a note on solar communities.

15. (a) Discuss the mechanical specification employed in solar panel.

Or

(b) Illustrate the development of solar thermal market in India.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. (a) What is Sun Shine? How does the sunshine recorder work?

    (b) Write a note on depletion of solar radiation. (5 + 5)

17. (a) How does Rankine cycle power plant work?

    (b) Write a note on solar pond based electric power plant. (5 + 5)

18. Describe the principle and construction of air based collector with a neat diagram.

19. Explain the following with suitable diagrams

    (a) Solar cooker

    (b) Domestic water heater.

20. Discuss the Ecological and economical aspects of solar energy use.

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R7331	Sub. Code
	540504

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

Third Semester

Energy Science

ADVANCED INSTRUMENTAL METHODS OF ANALYSIS

(CBCS – 2019 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** the questions.

1. Differentiate atomic spectroscopy and molecular spectroscopy.

2. Write any three applications of Atomic absorption Spectroscopy.

3. What is the principle of UV Spectroscopy?

4. Define SERS.

5. What is electrolysis?

6. What is analyte? Give an example.

7. What are the applications of EDAX?

8. Distinguish between STM and TEM.

9. Define TGA. What are the applications of TGA?

10. List various methods of thermal analysis.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the working of Atomic Fluorescence Spectroscopy with suitable sketch.

Or

(b) Discuss about X-ray Fluorescence methods.

12. (a) Explain UV absorption spectroscopy with suitable sketch.

Or

(b) Write a note on :

(i) Raman Spectroscopy

(ii) FTIR.

13. (a) What is potentiometry? Write down the applications of potentiometry.

Or

(b) Describe the working of cyclic voltammetry.

14. (a) Write the working and applications of Scanning Tunneling, Microscopy (STM).

Or

(b) Discuss the working principle XRD.

15. (a) Explain the concept of micro thermal analysis.

Or

(b) Write a note on Thermo Gravimetric Analysis (TGA).

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. With suitable diagram, explain construction, working and applications of Atomic Absorption Spectroscopy.

17. Discuss the working and applications of Fourier transform Infra-red Spectroscopy with suitable sketch.

18. Describe the working principle of Electrochemical Impedance Spectroscopy.

19. Write a note on :

    (a) Scanning Electron Microscopy

    (b) Transmission Electron Microscopy.

20. Explain Differential Scanning Calorimetry (DSC) with suitable sketch. State the limitations of DSC.

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