

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR**Odd Semester Mid-Term Examination, 2023-24****Course Code:** ME0741

Full Marks: 25

Course Name: Non-conventional Energy Systems

Time: 90 Minutes

Question Paper No.: NITDGP/ME0741/1

Date of Exam: 14/09/2023

Instructions: Answer all the questions.

Materials to be supplied: None

| Question No. | Body of the Question | Marks | Mapped CO |
|--------------|--|-----------|-----------|
| 1 | What is energy systems? What is decentralized and centralized energy system? Explain with schematics, how matching supply and demand is done. | 1+1+2 | CO1 |
| 2 | Define renewable and non-renewable by using a schematic diagram. What are the origins of renewable energy sources? | 3+2 | CO2 |
| 3 | By using a diagram define Global Horizontal Incident (GHI) radiation and Direct Normal Incident (DNI) radiation. What is the value of solar constant? | 3+0.5 | CO3 |
| 4 | Show that a wind turbine cannot extract more than 59.3% wind energy. | 1+1+3 | CO2 |
| 5 | Discuss the aerodynamic considerations in windmill design. | 1+1+0.5 | CO4 |
| 6 | A Wind Energy Generator (WEG) generates 1500 watts at rated speed of 24 kmph at the atmospheric pressure and temperature of 20°C. Calculate the change in output if the wind generator is operated at an altitude of 1800 m, temperature 10°C, wind speed 30 kmph, and air pressure 0.88 atmosphere. | 1+1+1+1+1 | CO2 |

Course Outcomes

CO1: Identify and explain the use of non-conventional energy systems.

CO2: Develop an understanding that solution to energy related problems are complex involving sociological, economic, political and technological consideration, decision and development.

CO3: Gain insight into the issues surrounding non-conventional energy sources development and use.

CO4: Become knowledgeable about applications of non-conventional energy systems as they apply to commercial, residential and industrial markets.