

**Name of the Examination : M. Tech. Energy Science and Technology First Year  
First Semester – 2024**

**Subject : Energy Resources**

**PART-I**

**Time: Three hours**

**Marks: 80**

**Answer any four questions.**

**( Use separate Answer Script for each Part)**

1. What are the different forms of solid fuels used for energy generation? Define rank of coal. Discuss the properties of bituminous coal and anthracite coal. 20
2. What are the advantages of gaseous fuels over liquid or solid fuels? Discuss the properties of natural gas and liquefied petroleum gas. What is dry and sweet natural gas? 20
3. How does coal-bed gas is generated and stored within the coal matrix? What is the composition of coal-bed gas? Describe the technical method applied for extraction of coal-bed methane for commercial exploitation. 20
4. Give the classification of petroleum crudes. Discuss the different forms of petroleum based liquid fuels used for energy production. 20
5. How geothermal energy is generated inside the earth crust? Discuss the potential of geothermal energy as an alternative source of energy in India. 20

**[Turn Over**

**M.TECH. ENERGY SCIENCE AND TECHNOLOGY**

**FIRST YEAR FIRST SEMESTER - 2024**

**Subject: ENERGY RESOURCES**

**Time: Three hours (Part I + Part II)**

**Full Marks: 20**

**Part -II**

Answer *any one* from the following questions.

- 1(a) Does the wind velocity at turbine depend on upstream wind velocity or downstream wind velocity? If yes, show how they are interdependent? In this context, find out the maximum performance coefficient of a wind turbine. [10]
- (b) With the help of a neat labeled diagram, describe in details, how a pyranometer is used for measuring radiation. [10]
- 2(a) Using a neat labeled diagram, illustrate the following angles with respect to solar radiation geometry: angle of incidence, zenith angle, solar altitude angle, slope, surface azimuth angle, and solar azimuth angle. In this context, define: latitude, slope, declination and hour angle. [10]
- (b) Beam radiation is incident on a flat plate collector tilted at an angle of  $29^\circ$  with the horizontal plane on 19<sup>th</sup> April 2024. The collector is placed at coordinates  $22.4989^\circ$  N and  $88.3714^\circ$  E facing south. Calculate the angle of incidence for the beam radiation at 7 a.m. and at 1.00 p.m. (local apparent time). [10]