



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

SUMMER-2024	
Exam Seat No.:	
Academic Year:2023-2024	Semester:II
Class:FY	Program:B.Tech
Branch Code:ELE	Pattern:2023
Name of Course:Power Generation Technologies	Course Code:2300118D
Max. Marks:60	Duration:2.30 Hrs.

**Instructions:** Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains \_03\_ page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

**Question No. 1 Attempt following Question**

- 1) Solve any one (6) CO2

a) What is meant by feed water in thermal power plant? What harms are caused if the feed water quality is poor with impurities?

OR

b) Discuss impact of hydro power plant on environment.

**Question No. 2 Attempt following Question**

- 2) Solve any one (6) CO1

a) Explain main components and working of Tidal Power plant.

OR

b) Explain the construction and working of Nuclear Power Plant.

**Question No. 3 Attempt following Question**

- 3a) What is geothermal energy? Explain with sketch how it can be harnessed to generate electricity? (8) CO4

OR

- 3b) Differentiate between Kaplan and Pelton wheel turbine. (8) CO4

- 3c) The head of water at a hydel station is 300 m. Assuming efficiency of the system to be 85%, calculate the quantity of water in cubic meter which will fall on the turbine per unit generation of power. (8) CO3

OR

- 3d) A hydel power plant has a reservoir having capacity of  $6 \times 10^8 \text{ m}^3$ , which supplies water at a head of 300 m. If the efficiency is plant A for 65 % and plant B for 90%, find Both condition total energy generated. (8) CO3

**Question No. 4 Attempt following Question**

- 4a) Describe the types of wind turbine electrical generators. (8) CO1

OR

- 4b) Explain the process Biomass energy conversion. (8) CO1

- 4c) A 350-mm three bladed wind turbine produces 750 KW at a wind speed of 10m/s. Air density is the standard  $1.225 \text{ kg/m}^3$ . Under these conditions, (8) CO3

(a) What is the efficiency of complete wind turbine (blades, gear box, generator) under these conditions?

(b) At what rpm does the rotor turn when it operated with a TSR of 3.5?

(c) what is tip speed of the rotor?

(d) If the generator turns needs to turn at 1200 rpm, what gear ratio is needed to match the rotor speed to the generator Speed.

OR

- 4d) The wind blowing at the rate of 19.05 m/s having the atmosphere at 5.5 bar, 550K. The wind is harnessed by a wind turbine having its efficiency of 0.65 and 80%. Find the total power and the actual power per square meter of rotor area which can be developed by the turbine of Both efficiency Condition. Assume  $R = 289 \text{ NM/kg K}$ . (8) CO3

**Question No. 5 Attempt following Question**

- 5a) Draw and explain the measurement solar radiation by Pyronameter. (8) CO2

OR

- 5b) i) Draw I-V characteristics for the given irradiation where,  $V_{oc}=55\text{v}$ , (8) CO2

Isc in amp.	Irradiation in watt/m <sup>2</sup>	Isc in amp.	Irradiation in watt/m <sup>2</sup>	Isc in amp.	Irradiation in watt/m <sup>2</sup>
3	250	7	650	11	1050
5	450	9	850	13	1250

Data is given at  $35^\circ\text{C}$  constant temperatures. Justify in your words.

ii) Draw I-V characteristics at different temperature where,  $I_{sc}=12\text{A}$  at  $800\text{watt/m}^2$  and refer above data. Justify in your words.

Voc in volt.	Temperature in $^\circ\text{C}$	Voc in volt.	Temperature in $^\circ\text{C}$
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65	15	58	30
60	20	48	35

5c) Design 12 KW solar PV plant using following data: (8) CO3

Max. Wattage- 495 W, Voltage max power ( $V_m$ )- 41V, Current max power( $I_m$ )- 9.5A,  
Open circuit voltage ( $V_{oc}$ )- 42V, Short circuit current( $I_{sc}$ )- 12A and No. of cells=165.

**OR**

5d) For given module  $V_{oc}$ =35V and  $I_{sc}$ =6A: (8) CO3

- Draw I-V curve when 7 modules connected in series and calculate the total voltage.
- Draw I-V curve when 5 modules connected in parallel and calculate the total current.
- Calculate Total power as per calculating in Point i and ii.

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