K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:II
Class:FY	Program:B.Tech
Branch Code:FYE	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.

		Marks	CO
Question No. 1			
1	Explain the working of given Components of Thermal power plant- (i) Air pre-heater (ii) Economiser (iii) Condenser	(6)	CO1
Question No. 2			
2	Name the essential components of gas turbine power plant.	(6)	CO1
Question No. 3			
3a)	Explain the function of the following component in HPP : (1) Spillway (2) Surge Tank (3)Water hammer	(8)	CO1
	OR		
3b)	Explain the working of Pelton turbine with neat diagram in hydro power plant.	(8)	CO1
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 5×10^8 m^3, which supplies water at a head of 200 m. If the efficiency is plant A for 70 % and plant B for 80%, find Both condition total energy generated.	(8)	CO3
Question No. 4			
4a)	Describe the types of wind turbine electrical generators.	(8)	CO1
	OR		
4b)	Explain the process Biomass energy conversion.	(8)	CO1

4c) A 40-m three bladed wind turbine produces 600 KW at a wind speed of 14m/s. Air density is the standard 1.225 kg/m³. Under these conditions, (8) CO3

(a) At what rpm does the rotor turn when it operated with a TSR of 4.0?

(b) what is tip speed of the rotor?

(c) If the generator turns needs to turn at 1800 rpm, what gear ratio is needed to match the rotor speed to the generator Speed.

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

OR

4d) The wind blowing at the rate of 18 m/s having the atmosphere at 4 bar, 600K. The wind is harnessed by a wind turbine having its efficiency of 50% and 60%. 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 = 287 NM/kg K. (8) CO3

Question No. 5

5a) Explain the Components of solar radiation below- (8) CO2

i) Direct Radiation ii) Diffuse Radiation iii) Global Radiation

OR

5b) i) Draw I-V characteristics for the given irradiation where, Voc=50v, (8) CO2

Isc in amp.	Irradiation in watt/㎡	Isc in amp.	Irradiation in watt/㎡	Isc in amp.	Irradiation in watt/㎡
2	200	6	600	10	1000
4	400	8	800	20	1200

Data is given at 25℃ constant temperature. Justify in your words.

Voc in volt.	Temperature in ℃	Voc in volt.	Temperature in ℃
55	10	48	40
50	25	45	55

ii) Draw I-V characteristics at different temperature where, Isc=14A at 1000watt/㎡and refer above data. Justify in your words.

5c) Design 11 KW solar PV plant using following data: (8) CO3

Max. Wattage- 455W, Voltage max power (Vm)- 42V,
Current max power(Im)- 10.5A, Open circuit voltage (Voc)- 48V,
Short circuit current(Isc)- 11A and No. of cells=145.

OR

5d) For given module Voc=35V and Isc=10A: (8) CO3

i) Draw I-V curve when 4 modules connected in series and calculate the total voltage.

ii) Draw I-V curve when 5 modules connected in parallel and calculate the total current.

iii) Calculate Total power as per calculating in Point i and ii.

····· End of question paper·····