Name: **Enrolment No:**	

UPES

End Semester Examination, December 2023

Program Name: M. Tech RE **Semester : 1st**

Course Name: Wind and Tidal energy **Time : 3 hrs.**

Course Code: EPEC7071 **Max. Marks: 100**

Nos. of page(s):

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q	Statement of question		**CO1**
Q1	List two characteristics of wind related to WECS.	**4**	**CO1**
Q2	Enumerate the environmental impacts associated with tidal power generation?	**4**	**CO2**
Q3	Derive an expression of power extracted from the wind turbine.	**4**	**CO3**
Q4	Discus the scenario of tidal power system sites in India.	**4**	**CO2**
Q5	Calculate the wind load on the wind-facing wall of the building using the following details: The convenience store wind-facing wall dimensions are: 12' tall, 20' long. How much force will be exerted on the wind-facing wall of the building by the wind?	**4**	**CO3**
SECTION B **(4Qx10M= 40 Marks)**			
Q6	Explain the limitations of the power extracted by a wind turbine working on aerodynamic principle.	**10**	**CO2**
Q7	Briefly describe various control mechanisms in wind turbines.	**10**	**CO1**
Q8	What role do government policies play in the development and expansion of wind energy? Or A wind turbine has a rated capacity of 2 megawatts (MW) and operates at 30% capacity factor. Calculate the average power output of this turbine.	**10**	**CO3**
Q9	A horizontal axis wind turbine has a diameter of 6 m. When the wind speed unaffected by the turbine is 10 m/s, the turbine rotates at 300 rpm and produces 5 kW of mechanical power. Find the tip-speed ratio and the power coefficient.	**10**	**CO3**

SECTION-C (2Qx20M=40 Marks)			
Q10	Briefly Describe various technologies associated with tidal energy. Or A wind farm consists of five wind turbines. Three turbines have two blades each, and the remaining two turbines have three blades each. If the two-blade turbines have a rotor diameter of 60 meters and the three-blade turbines have a rotor diameter of 80 meters, calculate the total area covered by the blades in the wind farm	**20**	**CO2**
Q11	A wind turbine with a rotor diameter of 55 m is rated at 1 MW at a hub height wind speed of 14 m/s. It has a cut-in speed of 4 m/s and a cut-out speed of 25 m/s. Assume that this machine is located at a site where the mean wind speed is 10 m/s and that a Rayleigh wind speed distribution can be used. Calculate the following: (a) The number of hours per year that the wind is below the cut-in speed. (b) The number of hours per year that the machine will be shut down due to wind speeds above the cut-out velocity. (c) The energy production (kWh/year) when the wind turbine is running at rated power. Or How do advancements in technology improve the power efficiency of wind turbines?	**20**	**CO1**