Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Program Name: M.TECH-REEE **Semester : II**
Course Name : Small Hydropower and Wind Energy Technologies Time : 03 hrs.
Course Code : EPEC-7050 **Max. Marks: 100**
Nos. of page(s) : 02

Instructions: Attempt All Questions. One question from section B and C have an internal Choice. Assume any Missing Data if required.

SECTION A

S. No.		Marks	CO
Q 1	State main advantages of model testing in case of hydraulic turbines.	**4**	**CO1**
Q 2	Discuss, how we can use Pump as Turbine (PAT)?	**4**	**CO2**
Q 3	Elaborate various wind energy conversion devices.	**4**	**CO3**
Q 4	Discuss Weibull probability distribution to measure wind variation.	**4**	**CO4**
Q 5	Elaborate effects of wind turbine on the environment.	**4**	**CO5**
	SECTION B		
Q 6	Explain, construction and working of Francis Turbine in details.	**10**	**CO2**
Q 7	Find the required diameter of a wind turbine to generate 15 KW at a wind speed of 10 m/s and a rotor speed of 150 rpm. Assume power coefficient=0.4, efficiency of Mechanical transmission= 0.95 and efficiency of generator=0.9	**10**	**CO3**
Q 8	Discuss wound rotor induction generators with labeled diagram.	**10**	**CO4**
Q 9	Discuss various economical aspects of Wind power plant.	**10**	**CO5**
	SECTION-C		
Q 10	A Kaplan turbine delivering 40 MW works under a head of 35 m and runs at 167 rpm. The hub diameter is 2.5 m and runner tip diameter is 5 m. The overall efficiency is 87%. Determine the blade angles at the hub and tip and also at a diameter of 3.75 m. Also find the speed ratio and flow ratio based on tip velocity. Assume hydraulic efficiency = 90%.	**20**	**CO2**

	OR In a Francis turbine installation the runner inlet is at a mean height of 2 m from tailrace while the outlet is 1.7 m from the tailrace. A draft tube is connected at the outlet. The runner diameter is 1.5 m and runs at 375 rpm. The pressure at runner inlet is 35 m above atmosphere, while the pressure at exit is 2.2 m below the atmosphere. The flow velocity at Inlet is 9 m/s. At output it is 7 m/s. Available head is 62 m. Hydraulic efficiency is 90%. Determine the losses before the runner, in the runner and at exit.		
Q 11	Analyze the aerodynamics of wind rotors using Blade Element Theory.	**20**	**CO4**