International Islamic University Chittagong
Department of Electrical and Electronic Engineering

Final Examination Autumn-2020	Program: B.Sc. Engg. (EEE)
Course Code: **EEE-4843**	Course Title: **Renewable Energy System**
Time: **5 hours** (Writing -**4 hours 30 minutes** + **30 minutes** submission time)	Full Marks: **50** (**Written** 30 + **Viva/Viva-Quiz**-20)

[Answer **each of the** questions from the followings; Figures in the right margin indicate full marks. **Answer script must be submitted through online method within 5 hours from starting time. Also, write down the Q. Set on the front page of your answer script]**

1(a).	Between Si Solar cells and GaAs Solar cells, which one is more suitable for high temperature application and why?	CO1	Un	02
1(b).	"Solar cell efficiency limits as a function of the band gap of the cell absorber material"- Justify the statement.	CO1	An	02
1(c).	Consider a p–n junction diode at 25°C with a reverse saturation current of 10^{-8} A. Find the voltage drop across the diode when it is carrying the following: a) I_d=0 A b) I_d=R A where R= N+1; N is the last digit of student ID.	CO3	E	02
2(a).	"Supercapacitor as energy storage device"- Illustrate	CO2	U	02
2(b).	Illustrate the similarities and dissimilarities among Lithium-ion (Li-ion) batteries, Compressed Air Energy Storage (CAES) and Superconducting Magnetic Energy Storage (SMES).	CO1	Un	02
2(c).	Suppose that batteries located at a remote telecommunications site may drop to -20°C. If they must provide 4 days of storage for a load that needs 550 Ah/day at 12 V, how many amp-hours (up to four decimal numbers) of storage should be specified for the battery bank?	CO3	E	02
3(a).	Derive the equation of generated power from the wind.	CO1	An	02
3(b).	Draw the block diagram of a Limited Variable Speed wind energy conversion system and mention some drawbacks.	CO2	Un	02
3(c).	A 50-m, three bladed wind turbine produces 400 kW at a windspeed of 14 m/s. Air density isthe standard 1.225 kg/m^3. Under these conditions (up to four decimal numbers), a. At what rpm does the rotor turn when it operates with a TSR (Tip-speed ratio) of 4.0? b. What is the tip speed of the rotor? c. If the generator needs to turn at 1700 rpm, what gear ratio is needed tomatch the rotor speed to the generator speed? d. What is the efficiency of the complete wind turbine (blades, gear box, generator) under these conditions?	CO3	E	02
4(a).	Illustrate the dual stages system configuration for grid connection of PV system.	CO2	U	03

4(b).	Describe the selection of PV system configuration based on voltage and current.	CO1	An	03
5(a).	What do you think about the potentiality of harvesting energy from Biomass in Bangladesh? Give your logical arguments in favor of your opinion?	CO1	An	02
5(b).	Do you think Tidal power plant and Wave energy generator are different? If yes, mention the differences between these two types of energy conversion system.	CO1	R, Un	02
5(c).	Consider a tidal site in the coastal area of Chittagong that observed difference between the high and low tide is 7 m. The basin area is about 0.7 sq. km which can generate power for 4 hours in each cycle. The average available head is 7 m and overall efficiency of generation is 70%. Also, consider specific weight of sea water is 1020 kg/m^3 and there are 715 full tidal cycles in a year. If a tidal power plant is going to be install at that location, Calculate the yearly power output from that plant. Also, make a comment about the feasibility of the tidal power plant at that specified location.	CO3	E	02
6.	Viva/Viva-Quiz: The time of viva/viva-quiz will be declared in google classroom.			20