Department of Electrical Engineering
Assignment
Date: 20/04/2020

Course Details

Course Title: Direct Energy Conversions **Module:** _____
Instructor: _____ **Total Marks:** 30

Student Details

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Note: Plagiarism of more than 20% will result in negative marking.
Similar answers of students will result in cancellation of the answer for all parties.

Q1.	(a)	In Renewable Energy Systems Solar Photo Voltaic and Fuels Cell are among the popular choice of technologies used for Direct Energy Conversion. For your home town of (State your city), which will be the better option to power a 10 KW load. Explain your answer based on its pros & cons, users, applications, availability and market. Back your reasons with valid data, facts and figures.	Marks 10
Q2.	(a)	PV Cells performance is greatly affected by a location's climate factors which include irradiance, temperature, humidity and wind. Different locations have different climate conditions. For your home town of (State your city and climate conditions), based on its average climate conditions what techniques will you apply to a PV cell to reduce the effects of climate on the cells performance, reduce losses and increase efficiency. Back your reasons with valid data, facts and figures.	Marks 10
Q3.	(a)	Fuel Cells have many types based on temperature, electrolyte and fuel. What would be the best option and the worst option among the types of fuel cell for providing power to Iqra National University (Take the last 3 digits of your student ID to be the average load KW of INU) located in Peshawar. Explain your choices based on the pros & cons, applications, availability and market. Back your reasons with valid data, facts and figures.	Marks 10

Question 01:

The world is shifting towards renewable energy because it has much more advantages over other sources of energy. Solar energy is that type of energy in which sunlight is directly converted into electrical energy with the use of solar panels, while in fuel cells chemicals are converted into electrical energy and the reaction is carried out by combination of hydrogen and oxygen which produces water, heat and electricity. Both sources have their advantages and disadvantages but as per location (Peshawar) which is in favor of using solar energy as temperature of this area is very high and also large area is available for the installment of the plant. Moreover, the equipment's of solar energy power production system is easily available in the market. If we go for the maintenance the solar system maintenance is easily and as available frequently in market therefore easy to replace in case of damage. In case of duel cells, although its power production is much more but the equipment's are costly and less available in market. When we compare the level of efficiency the solar fuel cell is efficient but to gain high efficiency the level of the cost is increased to high level. But the net metering functionality involvement with the solar power plant gives advantage to the customer with the reduction of the electricity bill. So, according to our location and all other feasibilities solar is best option to produce 10 kW of power.

Question 02:

Temperature of our area, Peshawar is very high and also large space is available for solar plant implantation so more and more solar power can be used for the production of electricity. Efficiency of solar power mostly depends upon temperature, pressure and production level. For this purpose maximum power point tracking should be used for adjustment of angles. Perturb and observe optimization is used mostly for the tracking of the maximum power point. In addition, motorize control should be used so that the panels are movement with the change in the location of the sun. There should be gap

between panels so air pressure can pass through it without affecting panels. The control of heat level is made by placing the panel at one inch above the roof for convective air flow. Panels should be made of lighted colour material to reduce heat absorption. Panels should be placed in such a manner that a shade of one panel should not affect the other. If the effect of the partial shading occurs, then it shorts the cells and reduce the level of the generation. Sometimes the presence of the mud on the panel reduces its production so wash the panel with the water after 15 -30 days. By controlling all these parameters and using power electronics our solar will give maximum efficiency and production.

Question 03:

The best choice for the fuel will be Solid Oxide (SOFC) having efficiency of 60% and the worst choice will be phosphoric acid (PAFC) having efficiency of 40%. The advantage of SOFC is that it used as auxiliary power, distributed generation and electric utility. On contrary to it, PAFC is only applicable for the purpose of distributed generation. According to our case (634 kW power) we prefer SOFC because it has low emission and it works on both high and medium temperature. Moreover, it has high flexibility; its life expectancy is 40,000 to 80,000 hours. In addition to this the electrolytes used here are non-corrosive. Higher level of efficiency and the production makes it dominant on the other panels.