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**SARDAR PATEL UNIVERSITY****M.Sc. (Renewable Energy) Examination, Second Semester****Day and Date:** Friday, 24.04.2015**Session:** Morning, **Time:** 10:30 to 13:30**Subject/ Course Code:** PS02CREN03 / **Paper No. 3****Subject/ Course Title:** Hydro Energy and Chemical Energy Sources**Q-1 Choose the correct answer****(8)**

- (i) The power equation for the hydro electric power station is given by.....
- |                        |                        |
|------------------------|------------------------|
| a. $P = 9.81 QH\eta$   | b. $P = 9.81 / QH\eta$ |
| c. $P = QH\eta / 9.81$ | d. $P = 9.81 QH/\eta$  |
- (ii) ..... Turbine is suitable for low head hydro power plants
- |                     |                       |
|---------------------|-----------------------|
| a. Reaction Turbine | b. Axial Flow Turbine |
| c. Tube Turbine     | d. Bulb Turbine       |
- (iii) Alkaline Fuel Cell (AFCs) uses..... as an electrolyte
- |              |              |
|--------------|--------------|
| a. NaCl      | b. KOH       |
| c. $H_2SO_4$ | d. $H_3PO_4$ |
- (iv) Maximum efficiency of Hydrogen Oxygen fuel cell is .....
- |         |         |
|---------|---------|
| a. 63 % | b. 93 % |
| c. 53 % | d. 83 % |
- (v) The process of splitting water into hydrogen and oxygen by means of direct electric current is known as .....
- |                   |                 |
|-------------------|-----------------|
| a. Photolysis     | b. Hydrolysis   |
| c. Photosynthesis | d. Electrolysis |
- (vi) The operating temperature range of the Solid Oxide Fuel Cell is .....
- |                |               |
|----------------|---------------|
| a. 70-100 °C   | b. 50-100 °C  |
| c. 800-1000 °C | d. 160-210 °C |
- (vii) As per Ministry of New and Renewable Energy, micro hydro power station has the capacity of
- |                |                      |
|----------------|----------------------|
| a. 101-1000 kW | b. Upto 100 kW       |
| c. 1-25 MW     | d. None of the above |
- (viii) The combination of two different energy systems installed at a single location to ensure the continuity of electricity supply is called .....
- |                               |                      |
|-------------------------------|----------------------|
| a. Stand alone system         | b. Hybrid System     |
| c. Decentralized power system | d. None of the above |

**Q-2 Answer any seven short questions**

**(14)**

- a. Give the classification of water turbines
- b. Explain tube turbine with suitable diagram
- c. It is required to develop 15000 kW at 214 RPM under head of 100 m with single runner. What type of turbine should be installed?
- d. Explain principle operation of acidic fuel cell with suitable figure
- e. Give different type of fuel cell with their characteristics
- f. Give possible areas of hydrogen use
- g. Explain Solar wind hybrid system in brief
- h. Explain mycrohydel PV in brief
- i. Describe in brief solar energy method for  $H_2$  production

**Q-3** A. Explain working of Francis water turbine with suitable diagrams

**(6)**

B. Explain major components of small hydropower project

**(6)**

**OR**

Explain with suitable diagram

**(6)**

**Q-4** A. Explain Alkaline Fuel Cell (AFCs) with suitable diagram

**(6)**

B. Give advantages of fuel cell power plant

**(6)**

**OR**

Derive expression for output, efficiency and EMF of fuel cell

**(6)**

**Q-5** A. Explain Biogas –solar thermal hybrid system with case study

**(6)**

B. PV hybrid with Diesel Generator

**(6)**

**OR**

Explain the need of hybrid system and give type of hybrid system

**(6)**

**Q-6** A. Explain Westinghouse electrochemical thermal sulfur cycle with suitable diagram

**(6)**

B. What is electrolysis? Describe electrolytic production of hydrogen with suitable diagram

**(6)**

**OR**

What are the different methods for hydrogen storage?

**(6)**

—X—