

Reg. No. :

Name :

M-Tech Degree Examination

First Semester

Model question paper I

Branch: Mechanical Engineering

Specialization: Thermal Power Engineering

MMETP 106 - 1 Fuel Cell Technology

(Regular -2013 Admission)

Answer All Questions

Time: 3 hrs

Max. Marks: 100

1. a) Explain Acid and Molten carbonate fuel cell **9 Marks**
- b) Explain advantages and disadvantages of fuel cell **8 Marks**
- c) Explain the difference between ordinary batteries and fuel cell. **8**

OR

2. Explain Alkaline, Proton exchange membrane and direct methanol fuel cell. **25 Marks**
3. a) Explain the Gibbs free energy formation in electro chemical fuel cell **10 Marks**
- b) Explain basic reaction in fuel cell and enthalpy formation and enthalpy change of reacting system. **15 Marks**

OR

4. a) Explain Efficiency and power due to entropy change and internal ohmic heating. **15 Marks**
- b) Write short note on efficiency of electrochemical energy conversion with factors affecting on it. **10 Marks**
5. Write short note on
 - a) Effect of temperature on free energy change. **9 Marks**
 - b) Effect of pressure on free energy change. **8 Marks**
 - c) Reaction between free energy change in a cell reaction and cell potential. **8 Marks**

OR

6. For a voltaic cell $\text{Sn}(c) \text{Sn}^{2+}(0.150\text{M}) \parallel \text{Pb}^{2+}(0.550\text{M})/\text{Pb}(s)$
- a) What is E cell initially? **5 Marks**
 - b) If the cell is allowed to operate spontaneously will E cell increase, decrease or remain constant with time? **5 Marks**
 - c) What will be E cell when $[\text{Pb}^{2+}]$ has fallen to 0.500M? **5 Marks**
 - d) What will be $[\text{Sn}^{2+}]$ at the point where $E_{\text{cell}} = 0.020\text{V}$? **5 Marks**
 - e) What are the ion concentration when $E_{\text{cell}} = 0$? **5 Marks**
7. a) Explain design considerations and explain stack design. **9 Marks**
- b) Write short notes on stack cost, life reliability and stack performance. **8 Marks**
- c) Discuss tripolar plate design in the case of solid oxide fuel cell. **8 Marks**

OR

8. a) Explain relevance of “water management” in the case of proton exchange membrane in fuel cell. **9 Marks**
- b) Write short note on micro fuel cells. **8 Marks**
- c) Explain a layout of a fuel cell in automobile. **8 Marks**