Department of Mechanical Engineering
Birla Institute of Technology and Science, Pilani, Pilani campus

ME F414: Fuel Cell Science and Technology

Mid Semester Examination (12/10/2023)

Time: 90 min; Max. Marks: 25

Note to Students:

1. Please follow all the *Instructions to Candidates* given on the cover page of the answer book.
2. This is a CLOSED BOOK test.
3. Assumptions made, if any, should be stated clearly at the beginning of your answer.

1. Fuel cells are usually compared with current rather than current density. Is the statement true? Give reasons in either case. 1+2 = **3**

2. What is Galvani potential? With a proper schematic, explain its significance in reduction/ increase in activation barrier for fuel cell reaction. If a fuel cell reaction exhibits $\alpha = 0.5$ and $n = 2$ at room temperature, what activation overvoltage is required to increase the forward current density by one order of magnitude and decrease the reverse current density by one order of magnitude? You may use $R = 8.314\ JK^{-1}mol^{-1}$, $F = 96{,}485\ C/mol.$ 2+6+4 = **12**

3. What do you mean by concentration cells? Explain with an example. **5**

4. A fuel cell operates for 1 hour at 2 A current load and then operates for 2 more hours at 5 A current load. Calculate the total number of moles of H_2 consumed by the fuel cell over the course of this operation. To what mass of H_2 does this correspond? Assume 100% fuel utilization. 4+1 = **5**

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