

**B.E. (Chemical) – 3<sup>rd</sup> Semester**

**(Mid Term–1, Oct 2021)**

Time: 1 hours

Max. Marks = 25

**Note: All questions are compulsory**

**UNIT – 1**

- Q.1 a) Explain ideal and real fuel cell efficiency and the terms involved in it. 5
- b) 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<sub>2</sub> consumed by the fuel cell over the course of this operation. To what mass of H<sub>2</sub> does this correspond? Assume 100% fuel utilization. 5
- Q.2 a) Explain types of fuel cell based on electrolyte and discuss which kind of fuel cell are used at low temperature and high temperature? 5
- b) Consider an SOFC system with an electrical efficiency of 55%. Suppose the SOFC rejects heat at 800°C. 5
- i. If a heat engine takes this input heat from the fuel cell and rejects it at 100°C, what is the Carnot efficiency of this heat engine?
- ii. Assume that the practical efficiency of the heat engine is 60% of the Carnot efficiency. In this case, if the heat engine and fuel cell are combined, what would be the net electrical efficiency of the combined system?
- Q.3 Drive Butler-Volmer equation and explain the term activation overvoltage involved in it? 5