

Total No. of Questions : 10]

SEAT No. :

P4549

[Total No. of Pages : 2

[4959] - 1190

**B.E. (Chemical Engineering)**

**FUEL CELL TECHNOLOGY**

**(2012 Pattern) (Elective - IV(c)) (End Semester)**

*Time : 2½ Hours]*

*[Max. Marks : 70*

*Instructions to the candidates :*

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

**Q1) a)** Compare briefly between electrolytic cells and galvanic cells. [5]

b) What is the EMF of a cell? By taking an example demonstrate how to calculate it from the electrode potentials. [5]

OR

**Q2)** What are Helmholtz planes? Describe how the concept is used to understand the mechanism of ionic transport at the surface of the electrode? [10]

**Q3)** Derive Tafel Equation from the first principles. [10]

OR

**Q4)** Describe the construction and working of a hydrogen fuel cell. [10]

**Q5) a)** Describe the construction and working of a Proton Exchange Membrane Fuel Cell. [8]

b) Obtain expression for volumetric transfer current for a PEMFC, from general formulation of a Butler Volmer function. [8]

OR

**P.T.O.**

**Q6)** Write short notes on any three: [16]

- a) Anodic Materials of PEMFCs
- b) Cathodic Materials of PEMFCs
- c) Electrode Support Materials
- d) Membrane Electrolyte Materials

**Q7)** a) Describe the construction and working of a Solid Oxide Fuel Cell. [8]

- b) Describe with model equations to estimate the account for adsorption, desorption and diffusion at the three phase regions. [8]

OR

**Q8)** What is an overpotential? What difficulties and ill effects associated because of them are taken care at the time of design of a fuel cell? Describe various types of overpotentials. Write model equations for any one of them. [16]

**Q9)** a) Describe a complete fuel cell system. [9]

- b) What types of various treatments need to be given to a fuel before it is fed to the fuel cell and why? [9]

OR

**Q10)**a) Describe any one heat recovery system in details used in the fuel cell system consisting SOFC. [9]

- b) What are hybrid fuel systems? Describe their advantages and disadvantages over a single type fuel system. Describe any one arrangement of a hybrid fuel system. [9]

