Total No. of Questions : 10]

SEAT No. :

P3341

[Total No. of Pages : 2

[5254]-720

B.E. (Chemical)

FUEL CELL TECHNOLOGY (Elective - IV)

(2012 Pattern) (Semester - VI)

Time : 2:30 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8, Q9 or Q1O.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume Suitable data if necessary.*

Q1) Compare polymer electrolyte membrane fuel cell and solid oxide fuel cell. Describe the construction and working of any one of them. **[10]**

OR

Q2) a) When the same quantity of electricity is passed through two voltmeters arranged in series 1.12 dm^3 of dry H_2 gas is liberated at NTP and 9×10^{-4} kg of metal is deposited at cathode in other voltmeter. Calculate the equivalent mass of metal if that of hydrogen is 1 **[5]**

b) What is emf series? What is its importance in the design of a fuel cell?**[5]**

Q3) What are Tafel plots? Derive Tafel equation from the first principles. Describe its use in the fuel cell design. **[10]**

OR

Q4) What is reforming? How is ATR i.e Auto Thermal Reforming used to manufacture hydrogen needed for a fuel cell? Describe its advantages and disadvantages. **[10]**

Q5) a) What are the criteria for selecting anodic materials of a proton exchange membrane fuel cell system? **[8]**

b) Describe various cathodic catalyst materials used in the construction of a Proton Exchange Membrane Fuel Cell and their possible functions in its working. **[8]**

OR

P.T.O.

Q6) Write short notes on ANY THREE **[16]**

a) Anodic Materials of PEMFCs

b) Membrane Electrolyte Materials

c) Gas Diffusion Layer Materials

d) Schematic diagram of PEMFCs

Q7) a) What are the criteria for selecting cathodic materials of a Solid Oxide fuel cell system? **[8]**

b) Describe with the help of a diagram oxidation reaction on the TPB of an anode made of Ni-YSZ. **[8]**

OR

Q8) At equilibrium how electric potentials are related to chemical potentials of fuel and oxidizer stream in a fuel cell? Describe their importance in the design of a fuel cell. **[16]**

Q9) Write down generic fuel conversion reactions before a fuel (Natural Gas/ Naphtha) is fed to the fuel cell. **[18]**

OR

Q10) Write short notes on any three - **[18]**

a) Carbon Deposition Avoidance

b) Impurities Reduction in reforming

c) Steam Reforming

d) Recent development in harnessing hydrogen