*Total No of Questions: [6]* *SEAT NO. :*

**[Total No. of Pages : 2 ]**

*F.E. 2008 Course*

**107009 – Applied Science – II**

**Section –I Engineering Chemistry**

*Time: 2 Hours* *Max. Marks : 50*

*Instructions to the candidates:*

1) *Answer only three questions (Q 1 or Q 2, Q 3 or Q 4, Q 5 or Q 6)*
2) *Figures to right indicate full marks*
3) *Draw neat labeled diagram wherever necessary*
4) *Scientific calculator or logarithmic table is allowed*

## SECTION I

Q1) a) Explain Bomb calorimeter used for determining calorific value of solid fuel on the basis of Principle, construction and working with suitable diagram. [7]

b) (i) A sample of gaseous fuel contains, $H_2$ = 30%, CO = 12%, $CH_4$ = 4%, $CO_2$ =14%, N2 = 40% by volume. Find the volume of air required for complete combustion of $1m^3$ gaseous fuel, if 30% excess air is used and air contains 21% oxygen by volume. [4]

(ii) Define:- Octane no. and cetane no. [2]

(c) Compare low temperature carbonization with high temperature carbonization. [4]

OR

Q2) a) What is refining of petroleum? Discuss various steps involved in refining process. [7]

b) (i) 2.7 g, coal after heating for 1 hr. at $110^0$c, in the oven, the residue weighed 2.625 gm. The crucible was then covered with vented lid and heated at $950^0$c for 7 min. in the furnace the residue after Cooling weighed 2.5gm. The crucible was then heated without lid $725^0$c, for 30min. in the furnace,, the residue weighed 0.24gm. Calculate percentage result of proximate analysis. [4]

(ii) Define : G.C.V. and N.C.V. [2]

c) What is biodiesel? Give its general method of preparation. Give its advantages and disadvantages. [4]

Q3) (a) Define wet or electrochemical corrosion. Discuss mechanism of wet corrosion on the basis of nature of electrolyte. [7]

(b) What are the types of metallic coatings? Which type of coating is better and why? Explain Galvanizing process. [6]

(c) What is powder coating? What are the types of powder coatings? Give advantages and [4]

disadvantages of powder coating.

OR

Q4) a) What is the principle of cathodic protection? Discuss the types of cathodic protection. [7]

b) Define oxidation corrosion. Explain various types of oxide films formed with example. [6]

c) Explain any four factors affecting rate of corrosion on the basis of nature of environment. [4]

Q5) a) What are scales and sludges? Explain causes of scale formation and give disadvantages and preventive method used for scale. [6]

b) i) 10 ml standard hard water containing 6 gm $CaCO_3$ per liter required 12 ml EDTA solution. Whereas 10 ml sample water required 18 ml EDTA solution and 10 ml boiled sample water required 8 ml EDTA solution. Calculate total, temporary and permanent hardness of sample water. [4]

ii) Draw phase diagram for water system showing different areas, curves and triple point. [2]

c) Explain phosphate conditioning as an internal treatment of boiler feed water. [4]

OR

Q6) a) Explain Ion exchange method for softening hard water using suitable diagram along with regeneration reactions. Give advantages of this process. [6]

b) State Gibb's phase rule? Explain the various terms involved in it with suitable example. [6]

c) How many liters of 9% NaCl solution will be required to regenerate zeolite which has capacity of softening 30,000 liter of water having 600 mg $CaCO_3$ equivalent hardness per litre? [4]