(Please write your Roll No. immediately)

Roll No.....

First/Mid Term Examination
September, 2017

1st Semester (B. Tech.)
Paper Code: ETCH 113
Time: 1: 30 hr.

Sub: Applied Chemistry
Max. Marks: 30

Note: Attempt any three Questions including Question No.1 which is compulsory

1(a) Explain why the fusion curve of ice has a negative slope whereas the sublimation curve has a positive slope in the phase diagram?
(b) Write condensed phase rule and explain why it is used for two component systems.
(c) Calculate the mass and volume of air needed for the combustion of 1 kg of carbon.
(d) 1.56 g of the coal was kjeldahlized and NH_3 gas thus evolved was absorbed in 50.0 mL of 0.1 N H_2SO_4. After absorption, the excess (residual) acid required 6.25 mL of 0.1 N NaOH for exact neutralization. Calculate the percentage of N in the coal sample.
(e) A sample of coal was found to have the following percentage composition:
C = 75 %; H = 5.2 %; O = 12.1 %; N = 3.2 and ash = 4.5 %
Calculate the HCV and LCV of the coal sample. **[2 × 5]**

2(a) How would you determine the calorific value of a coal by Bomb Calorimeter? Explain with the help of a neat diagram.
(b) Describe the Otto-Hoffman's process for preparing coke and mention the by-products recovered in the process. **[5+5]**

3 Differentiate between (any two of) the following:
a) Fixed bed Catalytic Cracking and Moving bed Catalytic Cracking
b) Liquid phase thermal cracking and vapour phase thermal cracking
c) Octane number and Cetane number **[5+5]**

4 (a) Draw and discuss the phase diagram of lead-silver system. Discuss practical application of this system.
(b) Give a labeled phase diagram of water system and discuss the importance of Triple point. **[5+5]**

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END TERM EXAMINATION

FIRST SEMESTER [B.TECH] DECEMBER 2017

Paper Code: ETCH 113 **Subject: Applied Chemistry,**

Time : 3 Hours **Maximum Marks :75**

Note: Attempt any five questions including Q. No. 1 which is compulsory. Select one question from each unit. Assume suitable missing data, if any.

Q1. a) Define: i) Octane and Cetane number **(3x7=21)**
ii) Synthetic Petrol and Power alcohol.

b) Distinguish between softening and demineralization of water with chemical equations.

c) Name the disinfecting agents of water.

d) What is corrosion? How is it different from erosion?

e) Explain the following terms: i) Tinning ii) Metal cladding iii) Electroplating

f) Define: i) Gibb's Phase rule ii) Degree of freedom

g) Draw the phase diagram of water and explain the significance of triple point.

h) Name the catalyst of the following reactions: **(4)**

i) Hydrogenation of vegetable oils Pt

ii) Homogeneous catalysis of alkenes Ni / Pt

iii) Zeigler- Natta Polymerisation $TiCl_3$

iv) Haber's Process Fe

Unit-I

Q2. a) Explain the working of Bomb Calorimeter in detail with neat diagram. **(6)**

b) Calculate the GCV and NCV of a gaseous fuel from the following data: -

Volume gaseous fuel burnt at STP = 0.1 m^3 weight of water used for cooling= 26 kg

Temperature of inlet = 25^0C

Temperature of outlet = 35^0C

Weight of water produced by steam condensation= 0.02 kg

Latent heat of steam= 587 kCal/kg. **(6.5)**

Q3. a) Describe the method of a carbonization of coal to yield coke. **(6)**

b) Distinguish between proximate and ultimate analysis. Calculate the weight and volume of air required for condensation of 1 kg of carbon. **(6.5)**

Unit-II

Q4. a) Explain Heterogeneous catalysis with examples. Discuss the elementary steps of heterogeneous catalysis according to Langmuir- Hinshelwood mechanism. **(6)**

b) Derive the Michaelis-Menten equation for an enzyme catalysed reaction. Discuss the role of inhibilors in catalysis. **(6.5)**

P.T.O.

Q5. a) What are phase diagrams? Draw the cooling curves for the following:-
i) Pure substance in molten state.
ii) Molten mixture of two solids. **(6.5)**

b) Also, define the eutectic point. Draw and explain the phase diagram of Pb-Ag system. **(6)**

Unit-III

Q6. a) Discuss the lime-soda process used for removal of calcium and magnesium hardness. **(6.5)**

b) Calculate the amount of lime required for softening of 6000 L of hard water containing 90 ppm of $MgSO_4$. **(6)**

Q7. a) What is alkalinity of water and explain a method for its determination using methyl orange and phenolphthalein indicators. **(6.5)**

b) 100 ml of a sample required 10 ml of $\frac{N}{50}$ Hcl using methyl organge as indicator. Another 100 ml of sample required 4 ml of $\frac{N}{50}$ Hcl using phenolphthalein as indicator. Express the alkalinities in terms of mg of $CaCO_3$ per litre. **(6)**

Unit-IV

Q8. a) What are factors influencing corrosion? **(6.5)**

b) Define the following terms: **(6)**
i) Cathodic Protection
ii) Galvanization
iii) Sheradising

Q9. a) Discuss the mechanism of the following: **(6)**
i) Oxidation Corrosion
ii) Electrochemical or wet corrosion

b) Discuss in detail the protective measures used against corrosion. **(6.5)**

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