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Roll No. .....

BE–101

B. E. (First Semester) EXAMINATION, Dec., 2010

(Grading System)

(Common for all Branches)

ENGINEERING CHEMISTRY

Time : Three Hours

Maximum Marks : 70

Minimum Pass Marks : 22 (D Grade)

Note : Attempt any *one* question from each Unit. Parts of the question should be attempted at one place. All questions carry equal marks.

Unit – I

1. (a) Explain Boiler corrosion and its prevention. 5

(b) A sample of water was analysed as follows :

$CaCO_3$ = 10 ppm

$CaCl_2$ = 11·1 ppm

$MgCO_3$ = 20 ppm

$CaSO_4$ = 13·6 ppm

H^+ = 5 ppm

Organic matter = 25 ppm

Calculate the amount of lime and soda required for softening of 10000 litres of water. 5

P. T. O.

(c) Fill in the blanks : 4

(i) Hard water is not used for washing of clothes because it gives.....with soap.

(ii) 70 degree clark is equivalent to ..... ppm.

(iii) Highly basic anion exchangers are regenerated with.....

(iv) Some.....are desirable in drinking water to prevent dental cavities.

2. (a) Explain the various internal treatment methods for boilers. 5

(b) The total hardness of 1000 litres of water was completely removed by a zeolite softner. The zeolite softner required 50 litres of sodium chloride solution, containing 15 g/litre of NaCl for regeneration. Calculate the hardness of water. 5

(c) Fill in the blanks : 4

(i) Lime removes only.....hardness.

(ii) Non-carbonate hardness is due to the presence of .....of Ca and Mg.

(iii) Sodium Aluminate is used as a.....during purification of water.

(iv) Chlorination is a method of.....of water.

Unit – II

3. (a) Explain various types of carbonization of coal with their applications. 5

(b) A coal sample possesses the following composition :

C = 80%, H = 5%,
S = 5%, O = 2%,
N = 3%, Ash = 5%

Calculate : 5

(i) The minimum weight of air required for complete combustion of 1 kg of coal.

(ii) The volume of air required if 30% excess air is used.

(c) Fill in the blanks : 4

(i) Cetane number is related with .....fuels.

(ii) Decomposition of higher mol. wt. hydrocarbons into lower hydrocarbons by high temperature and pressure is called .....

(iii) Lower calorific value is obtained when products of combustion are.....to escape.

(iv) Sometimes calorific value is higher due to presence of .....in fuels.

4. (a) Explain knocking and octane number. How do you improve octane number of a fuel ? 5

(b) A gaseous fuel possesses the following composition :

$CH_4 = 40\%$

$C_2H_6 = 20\%$

$C_3H_8 = 20\%$

$C_4H_{10} = 20\%$

Calculate the volume of air required for combustion of 1 m^3 of this gaseous fuel. 5

(c) Fill in the blanks : 4

(i) To get more accurate calorific value cooling and fusewire corrections are done in ..... experiment.

(ii) A good fuel should possess.....calorific value.

(iii) In Dulong's formula the percentage amount of C, H, S and.....are used for determination of calorific value.

(iv) 10 litres of CO will require.....litres of O_2 for combustion.

Unit – III

5. (a) Explain the mechanism of thin layer lubrication. 5

(b) Explain the chemistry of rotary kiln with suitable diagram. 5

(c) Fill in the blanks : 4

(i) When graphite is dispersed in oil, it is called.....

(ii) Pensky-Marten's apparatus is used to determine.....of oil.

(iii) Silica bricks are classified as .....refractory.

(iv) Presence of Al_2O_3 makes the cement.....

6. (a) Explain the determination of carbon residue and SEN of a lubricant with their significance. 5

(b) Explain setting and hardening of cement. 5

(c) Fill in the blanks : 4

(i) For a machine working at low temperature the lubricant should possess.....pour point.

(ii) Greases are .....lubricants.

(iii) The ability of a refractory material to withstand high temperature is called.....

(iv) Calcareous materials supply.....to cement.

Unit – IV

7. (a) Discuss preparation, properties and uses of the following polymers (any *two*) : 5

(i) Glyptal

(ii) Silicone resins

(iii) PVC

(b) What is Natural Rubber ? Explain vulcanization of rubber. 5

(c) State whether the following statements are true *or* false : 4

(i) Teflon is obtained by the polymerization of $F_2C = CF_2$.

(ii) Bakelite is made from the action of urea and formaldehyde.

(iii) Nylon 6 : 6 contains amide linkage.

(iv) Buna S is obtained from butadiene and styrene.

8. (a) Explain addition and condensation polymerization with suitable examples and important features. 5

(b) Differentiate between thermoplastic and thermo-setting resins with suitable examples. 5

(c) Fill in the blanks : 4

(i) Chloroprene is the repeating unit in.....

(ii) Ethylene glycol and terephthalic acid give..... polymer.

(iii) Polymerization in which two or more different monomers take part is called .....

(iv) Functionality of phenol is .....

Unit – V

9. (a) Explain the principle of NMR spectroscopy and its applications. 5

(b) Explain the method of determination of mixed alkalinity in water. 5

(c) Fill in the blanks : 4

(i) In gas chromatography mobile phase is a.....

(ii) According to Lambert-Beer's law absorbance is directly proportional to the molar concentration and.....

(iii) EDTA method is used to determine.....of water.

(iv) Winkler's method is used for the determination of .....

10. (a) Differentiate between IR and UV spectroscopy. 5

(b) 10 ml $CaCO_3$ of strength 1 gm/litre requires 8 ml EDTA on titration. 10 ml of a water sample requires 6 ml of the same EDTA solution on titration. Calculate the total hardness of the water sample. 5

(c) State whether the following statements are true or false : 4

(i) Alkalinity in water is due to Cl^-, NO_3^- and SO_4^{--} ions.

(ii) IR spectroscopy deals with fingerprint region.

(iii) BOD is called chemical oxygen demand.

(iv) $Mn(OH)_2$ is used as an oxygen carrier in analysis of dissolved O_2.