B.E. Second Semester All Branches (C.B.S.) / B.E. Second Semester (Fire Engineering)

Materials Chemistry

P. Pages : 2 **NKT/KS/17/7204**

Time : Two Hours * 0 6 8 2 * Max. Marks : 40

Notes : 1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Illustrate your answers whenever necessary with the help of neat sketches.
7. Use of non programmable calculator is permitted.

1. a) During the determination of calorific value of a coal sample by Bomb calorimeter following results were recorded : **4**
Weight of fuel burnt = 1.85 gms
Water equivalent of calorimeter = 490 gms
Weight of water taken in calorimeter = 2200 gms
Initial temp. of water = 25.8ºC
Final temp. of water = 30.2ºC
Acid correction = 14 cal.
Fuse wire correction = 6 cal.
Thread correction = 5 cal.
Cooling correction = 0.26ºC.
If the fuel contains 7.5% of hydrogen, calculate the Gross & Net calorific value of the coal sample provided that the latent heat of steam condensed is 587 cal/gms.

b) Write note on **any two.** **6**

i) Rocket Propellants.

ii) LPG

iii) Significance of ultimate analysis of coal.

OR

2. a) How calorific value of a gaseous fuel is determined by Boy's calorimeter. **4**

b) How Biodiesel is synthesized by transesterification process? Discuss its properties & applications. **3**

c) Write an informative note on Non - conventional sources of energy. **3**

3. a) A Gas has the following composition by volume : $H_2 = 22\%$ $CH_4 = 4\%$, $CO = 20\%$ $CO_2 = 6\%$, $O_2 = 3\%$ and rest is N_2 . find out, **4+4**

a) Volume and weight of Air required for complete combustion of $100\,m^3$ gas.
b) If 15% excess air is supplied, calculate volumetric composition of dry products of combustion.

b) How synthetic gasoline is obtained by Fischer-Tropschs's process. **4**

OR

4. a) What is cracking? Discuss process of fluid bed catalytic cracking of heavy oil with its objectives and advantages. **6**

b) Write descriptive note on **any two.** **6**

i) Fractional Distillation.

ii) Octane and Cetane No.

iii) Knocking and chemical structure of hydrocarbon.

5. a) Why Greases are called as a thixotropic gel? State the condition under which semisolid lubricant are used. **3**

b) A transformer oil has the same viscosity as that of zero VI oil (Gulf oil) and 100 VI oil (Pennsylvanian oil) at 210ºF. Their viscosities at 100ºF are 320, 430 and 260 SUS resp. Find the viscosity index of the transformer oil. **2**

c) Explain the mechanism of Boundary Lubrication. **3**

OR

6. a) Explain the properties of Lubricants used in **3**
i) I. C. Engine
ii) Turbines
iii) Refrigerators

b) Define and state the significance of **any two.** **5**

i) Drop point and consistency test of grease.

ii) Cloud point and pour point.

iii) Flash point and Fire point.

7. a) What are composite material? Explain the engg. applications of composite material with suitable examples. **3**

b) What are carbon nanotubes? Discuss the application of Nano-technology in the fields of medicine and Environment. **4**

c) What are conducting polymers? Give properties and applications of polyaniline. **3**

OR

8. a) Give an account of synthesis, properties and applications of polylactic Acid (PLA), a biodegradable polymer. **4**

b) What are LCPs? Discuss different phases, properties and applications of LCP. **4**

c) Differentiate single and multiwalled carbon Nanotube. **2**

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