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

Materials Chemistry

P. Pages : 2 **NRJ/KW/17/4344/5001**

Time : Two Hours * 0 1 1 0 * 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. Diagrams and chemical equations should be given whenever necessary.
7. Illustrate your answers whenever necessary with the help of neat sketches.
8. Use of non programmable calculator is permitted.

1. a) How bio - diesel is obtained from vegetable oils? Write down the advantages and disadvantages of biodiesel. **4**

b) Describe the principle of rocket propulsion and classification of rocket propellants. **4**

c) Give the significance of proximate analysis. (solid fuels). **2**

OR

2. a) Calculate the gross and net calorific value of a gaseous fuel at STP from the following data obtained during the determination of calorific value using Boy's calorimeter. **4**

i) Volume of gaseous fuel burnt at STP $= 0.090\,M^3$.

ii) Weight of water used for cooling of combustion product = 30.5 kg.

iii) Weight of steam condensed = 0.025 kg.

iv) Temperature of incoming water = 21 ºC.

v) Temperature of outgoing water = 33 ºC

Assume heat liberated in condensation of water vapours as 580 kcal/kg.

b) Give the composition, properties and uses of CNG. **3**

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

3. a) A producer gas has the following composition by volume

$CH_4 = 3.5\%$, $CO = 25\%$, $H_2 = 8\%$

$CO_2 = 12\%$ and rest is N_2.

Calculate :

i) Theoretical quantity of air in M^3 required per cubic meter of the gas. **4**

ii) If 20% excess air is used, find the % composition of dry flue gas. **4**

b) Explain moving bed catalytic cracking. **4**

OR

4. a) Explain fractional distillation of crude petroleum. **4**

b) Describe synthesis of gasoline by Fischer - Tropsch process. **4**

c) Explain octane and cetane number and their relationship with the chemical structure of hydro carbon present in the fuel. **4**

5. a) Distinguish between thick film and thin film lubrication. **3**

b) What are solid lubricants? Under which conditioned are they used? **3**

c) A transformer oil has S.U.V. of 78 seconds at 210 ºF and 490 seconds at 100 ºF. Low viscosity gulf oil has S.U.V. of 78 seconds at 210 ºF and 710 seconds at 100 ºF. High viscosity Pennsylvanian oil has S.U.V. of 78 seconds at 210 ºF and 430 seconds at 100 ºF. Calculate the viscosity index of given oil. **2**

OR

6. a) Discuss Drop - Print Test of Greases. **3**

b) Write a note on : **5**

i) Lubricating emulsions.

ii) Extreme Pressure Lubrication.

7. a) Discuss the synthesis and applications of **4**

i) Polycaprolactone

ii) Poly lactic acid.

b) What are composite materials? Give general classification and uses of composite materials. **4**

c) Discuss carbon nano tubes and their types. **2**

OR

8. a) What are nano materials? Give applications of nano materials in the field of electronics and medicine. **4**

b) What are liquid crystal polymers? Write on different phases of LCP. **3**

c) Write a note on conducting polymer with suitable example. **3**

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