Faculty of Engineering & Technology
Second Semester B.E. (C.B.S.) Examination
MATERIALS CHEMISTRY
Paper—III (BEII–3T)

Time—Two Hours] [Maximum Marks—40

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Solve **FOUR** questions as indicated :

Q. No. **1 OR** Q. No. **2**

Q. No. **3 OR** Q. No. **4**

Q. No. **5 OR** Q. No. **6**

Q. No. **7 OR** Q. No. **8**

(3) Due credit will be given to neatness and adequate dimensions.

(4) Diagrams and Chemical equations should be given wherever necessary.

(5) Illustrate your answers wherever necessary with the help of neat sketches.

(6) Discuss the reaction, mechanism wherever necessary.

(7) Use of non-programmable calculator is permitted.

1. (A) Calculate the gross and net calorific value of coal having the following composition :

C = 80%, H = 8%, S = 1%, N = 2% and ash = 6% using Dulong's Formula. Given : Latent Heat of steam = 587 cal/g. 4

(B) Discuss following non-conventional energy sources w.r.t. applications and advantages :

(i) Solar Energy

(ii) Wind Energy. 4

(C) How does % of carbon and ash in coal affect the quality of coal ? 2

OR

2. (A) Explain the determination of calorific value of gaseous fuel by using Boy's gas calorimeter. 4

(B) What are Rocket propellants ? Explain the mechanism of rocket propulsion. 3

(C) Write an informative note on Bio-Diesel. 3

3. (A) A producer gas has the following % composition by volume :

CH_4 = 3.5%, CO = 25%, H_2 = 10%, CO_2 = 10.8% and N_2 = 50.7%. Calculate :

(i) The theoretical quantity of air required to burn 1 m^3 of above gas at N.T.P. 4

(ii) The volume composition of dry-products of combustion formed, if 25% excess air is used for combustion. 4

(B) Explain knocking in Diesel engine. How is it related to chemical structure of Fuel ? 4

OR

4. (A) What is catalytic cracking ? Explain moving bed catalytic cracking with neat sketch. 5

(B) Define : Octane no. and cetane no. How octane no. and cetane no. can be improved ? 3

(C) Draw a neat and labelled diagram of fractionating tower used for the fractional distillation of crude oil. Enlist various fractions obtained during fractional distillation with their boiling range and uses. 4

5. (A) Discuss Boundary film lubrication mechanism. 3

(B) Give the significance of the following properties of lubricating oils :

(i) Cloud and Pour point

(ii) Acid value

(iii) Viscosity index. 3

(C) An oil sample under test has saybolt universal viscosity same as that of low standard Gulf oil and high standard Pennsylvanian oil at 210 F. Their viscosities at 100 F are 61, 758 and 420 SUS respectively. Calculate V.I. of given oil. 2

OR

6. (A) What are Greases ? Under what operating conditions are they preferred ? 3

(B) Write short notes on (any **TWO**) :

(i) Synthetic lubricants

(ii) Graphite as a lubricant

(iii) Lubricating emulsions. 5

7. (A) What are Nanomaterials ? Give the applications of nanomaterials in the fields of medicine and electronics. 4

(B) What are composite materials ? Give the general classification of composite materials. Enlist any two uses of each type. 4

(C) Give the application of Liquid crystal polymers. 2

OR

8. (A) What are carbon nanotubes ? Give their types. 2

(B) Give an account of synthesis, properties and applications of Polypyrrole conducting polymer. 4

(C) Enlist the applications of poly caprolactone biodegradable polymer. Also give its synthesis and properties. 4