Name of the student: ..... **Roll Number:** .....

MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL
DEPARTMENT OF CHEMISTRY
Mid Term Exam May -2023

COURSE: B. Tech SEMESTER-2 **ENGINEERING CHEMISTRY (CHY-106)**
SECTION: B **Total Marks: 30** **Time:1.5 hours**

S. No.	Questions	Marks
1.	Explain the process of Proximate analysis of Coal, determining moisture, volatile matter, ash and carbon. Also describe the importance of these determinations.	5
2.	Liquid fuel weighing 0.98 g, containing 90% carbon and 8% hydrogen gave the following results in a Bomb Calorimeter: Weight of water taken = 1450g Water equivalent of bomb and calorimeter = 450g Rise in temperature = 1.8 ^{0}C If the latent heat of steam is 587 cal/g, calculate the Gross and Net calorific value of the fuel.	5
3.	Write informative notes on any **two**: a. Higher and Lower calorific value of fuel b. Caustic Embrittlement c. Role of Coagulants in purification of drinking water, with an example	2 × 05
4.	Explain Zeolite (Permutit) Process of softening of hard water with suitable reactions and diagram.	5
5.	A sample of water contains the following dissolved salts: $Mg(HCO_3)_2$ = 22 mg/litre, $CaCl_2$ = 85 mg/litre, $CaSO_4$ = 28 mg/litre, and $MgCl_2$ = 30 mg/litre. Calculate the temporary and permanent hardness.	5

MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY
DEPARTMENT OF CHEMISTRY

Course: B.Tech (*Semester-II*) **End-term Exam –June, 2023** **Time: 3 hrs.**

Sections (A,B,C,D,E) **Sub: Engineering Chemistry**

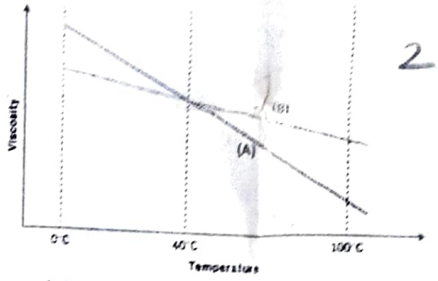
Sub Code: CHY106 ***Total Marks: 50***

Instruction: ***All questions are compulsory. Use graphics/schematics at appropriate places and keep clear separations while answering different questions.***

Q 1. (a) Discuss the mechanism of *Hydrodynamic* lubrication and compare it with Hydrostatic lubrication giving suitable examples (*two examples for each*). **4+4+2**

(b) How synthetic lubricants are important in tribology and maintenance, write key points?

(c) A student was given labeled bottles (A) & (B) one of which contains **Single Grade** while other **Multi-grade** lubricant. Student performed viscosity index (V.I) experiment for which the results are presented in the given figure. Find out the bottle which contains **Multi-grade** lubricant with proper justification.



Q 2. (a) What is caustic embrittlement? How does it affect the boilers operation? **4+2+4**

(b) What do you understand by TDS? How TDS is regulated while purifying water using *domestic/RO* water purifiers.

OR

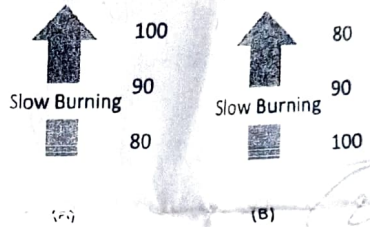
Suggest use of technology (*any two*) to Reduce/Reuse/Recycle water at domestic level.

(c) A sample of water contains the following data:
$MgCl_2$- 190 ppm, $CaSO_4$-136 ppm, $MgSO_4$-180 ppm, H_2SO_4 – 49 ppm, SiO_2-4ppm. Calculate the amount of lime (90% pure) and soda (96% pure) needed for treating 1 million of water.

Roll No.....

Q 3. (a)Discuss knocking mechanism in petrol/gasoline and Diesel engines. **3+3+4**

(b) Which of the following (A) and (B) in the given figure are related to octane and cetane numbers and why?



(C) A sample of coal contains 85% C, 8% H, 4% ash and this sample was tested in the Bomb- bomb calorimeter for which the observations are given below:

Weight of coal burnt = 0.85 g; Weight of water taken = 700 g; Water equivalent of calorimeter = 2000 g; Rise in temperature = 2.5 ^{0}C; Cooling correction = 0.02^{0}C; Fuse wire correction = 10 Cal.; Acid correction = 60 Cal.

Calculate the gross and net calorific values of the fuel. Comment on theexperimental validity of the calorific value.

Q 4. (a) Discuss thermodynamic criteria for a polymerization process to be feasible. **2+4+4**

(b) Explain the mechanism of coordination polymerization. Why is it different from ionic polymerization?

(c) What do you understand by setting and hardening of the cement? Write chemical reactions involved in these processes.

Q.5 (a) Write key differences between galvanic and concentrations cells. Suggest appropriate applications of the concentration cell. **4+3+3**

(b) Discuss sacrificial metallic protection from corrosion? What are the advantages and disadvantages of electroplating methods?

(c) What is the basic difference between paint and varnish? For outdoor metallic protection which of the two (paint/varnish) is more useful and why?