

**IV B.Tech I Semester Regular Examinations, November 2005**  
**PROPELLANT TECHNOLOGY**  
**(Aeronautical Engineering)**

**Time: 3 hours**

**Max Marks: 80**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) Define Raoult's Vapor pressure. Why is it important? [4]  
(b) Explain the phenomenon of vapor locking. [4]  
(c) Discuss briefly the properties of aviation gasoline affecting its performance. [8]
2. (a) What are the requirements for an igniter propellant in the case of solid rockets? [8]  
(b) What are gas generator propellants? What are their applications? Give some examples of gas generator propellants. [8]
3. Describe solvent-less extrusion technique for the manufacture of homogeneous solid propellants. [16]
4. What are Gelled propellants? Explain their advantages and disadvantages. [16]
5. What are cryogenic propellants? Explain their advantages and disadvantages. [16]
6. Explain pre-cooled Claude system for liquefaction of hydrogen. [16]
7. What are the different types of insulation used in cryogenic systems? Explain any three of them briefly. [16]
8. Write short notes on the following:  
(a) Liquid Helium II  
(b) Ortho hydrogen  
(c) Liquid oxygen  
(d) Deuterium. [16]

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1. (a) What are the characteristics of an ideal gasoline? [8]  
(b) Explain the steps involved in refining of gasoline. [8]
2. Describe in detail various types of hazards that can occur in handling solid propellants. [16]
3. What are different ingredients used in homogeneous propellants ? Explain them briefly. [16]
4. Discuss about the principal factors that should be considered in selecting a liquid propellant? [16]
5. What are cryogenic propellants? Explain their advantages and disadvantages. [16]
6. Describe Joule-Thomson effect. How it is used in the liquefaction of cryogenic propellants. [16]
7. Explain in detail expanded-foam insulations and gas filled powder and fibrous insulations used in cryogenic systems with their advantages and disadvantages. [16]
8. Write short notes on the following aviation fuels:
  - (a) JP-8
  - (b) Aviation Gas
  - (c) JP-4
  - (d) JP-5. [16]

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1. (a) Write about different types of chemical fuels? What are the characteristics of a good fuel? [8]  
(b) State the advantages and disadvantages of liquid fuels. [8]
2. (a) What are different classes of homogeneous solid propellants? Give examples for each class of propellants. [8]  
(b) Describe advantages and disadvantages of solid propellants. [8]
3. What are different ingredients used in homogeneous propellants ? Explain them briefly. [16]
4. Discuss about cold gas propellants and their characteristics? Where are they used? Give an example of cold gas propellant. [16]
5. What are the factors contributing to the losses in the efficiency of reciprocating compressors and expanders used in liquefaction systems? Explain them briefly. [16]
6. Explain cascade system for liquefaction of cryogenic gases. [16]
7. Explain in detail expanded-foam insulations and gas filled powder and fibrous insulations used in cryogenic systems with their advantages and disadvantages. [16]
8. Write short notes on the following relating to aviation fuels:  
(a) Surface ignition  
(b) Detonation  
(c) Vapor lock  
(d) Carburetor icing. [16]

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1. (a) What is meant by calorific value of a fuel? Distinguish between gross and net. calorific values of a fuel. [8]  
(b) What is meant by knocking in IC engines? Define Octane number of a gasoline. [8]
2. (a) Why are additives added to solid propellants? Describe different additives added to solid propellants. [8]  
(b) Describe the advantages and disadvantages of composite solid propellants. [8]
3. What are different ingredients used in homogeneous propellants ? Explain them briefly. [16]
4. What are Gelled propellants? Explain their advantages and disadvantages. [16]
5. What are the factors contributing to the losses in the efficiency of reciprocating compressors and expanders used in liquefaction systems? Explain them briefly. [16]
6. Describe Joule-Thomson effect. How it is used in the liquefaction of cryogenic propellants. [16]
7. (a) Describe Multilayer insulation used in cryogenic systems? [8]  
(b) How do you explain extremely low thermal conductivity of multilayer insulations? Discuss the advantages and disadvantages of multilayer insulations. [8]
8. Write short notes on the following liquid propellants:  
(a) Liquid hydrogen  
(b) UDMH  
(c) RP-1  
(d) Hydrogen peroxide. [16]

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