

B.Tech IV Year I Semester Examinations, December-2011
PROPELLANT TECHNOLOGY
(AERONAUTICAL ENGINEERING)

Time: 3 hours

Max. Marks: 80

Answer any five questions
All questions carry equal marks

- 1.a) What are the desirable physical and chemical properties to be considered in the selections of fuels to the missiles?
b) How the ignition, combustion and flame properties are tested and describe their importance in rockets? [8+8]
- 2.a) What are the various double – base propellants used and explain the advantages of nitro – cellulose (NC), Nitroglycerine(NG)?
b) How the composite propellants are made and explain the various binders used in this? [8+8]
- 3.a) What are the various ingredients and inorganic oxidizers used in solid propellants, composite solid propellants.
b) Explain about the importance binder, plasticizer, burn – rate, coolant pacifier solid explosive as applied to solid propellants. [8+8]
- 4.a) Classify various liquid propellants used in missiles and explain their advantages & applications.
b) Describe the requirement of liquid propellants which influence the priorities of the characteristics. [8+8]
- 5.a) What are the various liquid propellants used in practice and explain the applications of Nitric acid, Nitrogen tetroxide, liquid oxygen?
b) Describe the loading measurement and control be done in liquid propellants.[8+8]
- 6.a) Differentiate between liquid hydrogen and liquid oxygen which are used in cryogenic atmosphere.
b) Describe the construction and working of Expansion Engine used to produce cryogenic temperatures. [8+8]
- 7.a) What are the problems created in storing and transporting of cryogenic propellants and mention their solutions?
b) Sketch and explain the ideal cycle employed on cryogenic system. [8+8]
- 8.a) What are the various tests to be preferred to find the quality of propellants.
b) Sketch and explain the construction and working of a furnace in the production of propellants. [8+8]

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- 1.a) Describe the Economics factors and performance factors to be considered in selecting Rocket fuels.
- b) What are the various requirements to be considered in the selection of fuels for rockets? [8+8]

- 2.a) Classify various solid propellants used in missiles and mention their advantages and applications.
- b) Describe the requirements of solid propellants which influence the priorities of the characteristics of solid propellants. [8+8]

- 3.a) Describe the advantages & disadvantages of common composite and modified Composite solid propellants.
- b) Explain the effect on specific impulse and flame temperature by nitro glycerin and Ammonium perchturate- aluminum- poly utharene. [8+8]

- 4.a) Describe the characteristics & properties of liquid propellants used in rockets.
- b) Differentiate between mono – propellants and bi propellant system used in liquid propellants. [8+8]

- 5.a) Describe about physical hazards, corrosion, Explosion hazard, fire – hazard Accidental spills as applied to liquid propellants.
- b) Describe the performance of rockets by using liquid oxygen & Hydrogen peroxide. [8+8]

- 6.a) How the liquid Nitrogen and liquid helium work in the cryogenic atmosphere?
- b) What are the various properties to be considered in selecting propellants in cryogenic atmosphere? [8+8]

- 7.a) Differentiate between Helium 4 and Helium 3 and mention their combustion properties.
- b) What are the problems encountered in string of cryogenic propellants and mention the methods of elimination? [8+8]

- 8.a) What are the various methods adopted to find the pollutants delivered by the propellants used in rockets?
- b) What methods are adopted to find the ignition quality of propellants? [8+8]

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- 1.a) What are the various properties to be considered in selecting propellants in Rockets and missiles?
b) Differentiate between motor gasoline and Aviation gasoline mentioning their performance and applications. [8+8]
- 2.a) Describe the effect A burning rate on the specific impulse of various solid propellants used in practice.
b) Describe about specific impulse burning rate, temperature coefficient aging characteristics of solid propellants. [8+8]
- 3.a) Differentiate between single base and double base solid propellants and explain their properties.
b) Explain about the importance of inaduretent ignition, aging & useful life, over-pressure and failure as applied to solid propellants. [8+8]
- 4.a) Describe the storage and combustion properties of various liquid mono – propellants used in practice.
b) Explain the performance of hydrazine and Hydroxyl Ammonium nitrate in rockets& missiles. [8+8]
- 5.a) How the propellant loading tolerances are evaluated & mention its impact on the Performance?
b) How the ignition & combustion studies are made & mention its effect on the environment? [8+8]
- 6.a) Describe the performance of rockets using cryogenic propellants.
b) Describe the properties & applications of liquid nitrogen & liquid helium in cryogenic atmosphere. [8+8]
- 7.a) Differentiate between Helium -3 and Helium – 4 as propellants in cryogenic condition & mention their advantages.
b) Explain the storing and loading problems of cryogenic propellants and mention the methods of elimination. [8+8]
- 8.a) What are the various tests to be performed to find the quality calorific value of solid propellants.
b) Explain the method of particle size analysis and its measurement of propellants [8+8]

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- 1.a) What are the various in gradients present in petroleum and explain the process of making gasoline?
- b) What are the various tests to be performed to know the quality of petroleum products? [8+8]
- 2.a) Differentiate between single – base and double base propellants used in practice And mention their applications.
- b) What are the various factors to be considered in selecting metallised composite products? [8+8]
- 3.a) What are the effects of fuels and oxidizens in composite propellants and modified Composite solid propellants used in practice.
- b) Describe about detonation, deflagration hazard effects, insensitivity of rockets toxicity as applied to solid propellants. [8+8]
- 4.a) Describe the ignition studies of liquid propellants and its effect on the thrust & Temperature.
- b) Differentiate between solid and liquid propellants mention their advantages and applications. [8+8]
- 5.a) Describe the effect of tetroxide and unsymmetrical dim ethyl hydrazine (UDMH) on the performance to missiles.
- b) Describe physical hazards, corrosion, explosion hazard, fire hazard, health hazards as applied to. [8+8]
- 6.a) What are cryogenic propellants and mention the ingredients to be added to ignite at low temperature?
- b) Differentiate between liquid hydrogen and liquid oxygen used as cryogenic propellants. [8+8]
- 7.a) How the low temperature is obtained and explain Joule Thompson effect in cryogenic atmosphere?
- b) What are the various properties to be considered in selecting propellants to use in cryogenic temperature? [8+8]
- 8.a) Sketch & explain the Are image furnace & mention its advantages and applications.
- b) Explain the methods adopted to perform ignitiability studies of various propellants used in practice. [8+8]
