

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

**Course Code: ME467**  
**Course Name: CRYOGENIC ENGINEERING**

Max. Marks: 100

Duration: 3 Hours

**PART A***Answer any three full questions, each carries 10 marks.*

Marks

- |   |   |     |
|---|---|-----|
| 1 | (a) What you meant by cryogenics?   | (2) |
|   | (b) What is Type I and Type II superconductors?   | (3) |
|   | (c) Explain the historical development of cryogenics?                                     | (5) |
| 2 | (a) Explain Meissner effect?  | (3) |
|   | (b) Distinguish between Ortho Hydrogen and Para Hydrogen.                                 | (3) |
|   | (c) Explain the application of cryogenics in spacecrafts.                                 | (4) |
| 3 | (a) What are the performance parameters to be considered in gas liquefaction systems?     | (3) |
|   | (b) Explain two applications of superconductivity.  | (3) |
|   | (c) What is Precooled LindeHampson system?  | (4) |
| 4 | (a) What is FOM?  | (2) |
|   | (b) Explain the working of Stirling cryocoolers.  | (4) |
|   | (c) Explain the Ortho- para conversion of hydrogen in cryogenic gas liquefaction systems. | (4) |

**PART B***Answer any three full questions, each carries 10 marks.*

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|---|---|-----|
| 5 | (a) Explain Simon Helium liquefier and show the process path on a T-s diagram.  | (7) |
|   | (b) Why simple Linde-Hampson system cannot be used for liquefying gases such as He, H <sub>2</sub> , and Ne?  | (3) |
| 6 | (a) With neat sketches, explain any one liquefaction system for hydrogen.   | (6) |
|   | (b) Discuss the effect of compressor and expander efficiencies on the performance of Claude cycle.  | (4) |
| 7 | (a) Derive an expression for COP of a thermodynamically ideal isobaric source cold-gas refrigerator.  | (4) |
|   | (b) Explain working of Linde-Hampson refrigerator. Derive expression for COP considering efficiency of compressor and effectiveness of heat exchangers. | (6) |
| 8 | (a) Explain working of a Vuilleumier refrigerator. Derive an expression for COP of a  | (5) |

Vuilleumier refrigerator.

- (b) Discuss thermodynamics of magnetic cooling. (5)

**PART C**

*Answer any four full questions, each carries 10 marks.*

- 9 Explain the features of cryogenic fluid transfer systems. (10)
- 10 What are the different types of insulations used in cryogenic equipments? (10)
- 11 With the help of a neat sketch explain a typical cryogenic liquid storage vessel. (10)
- 12 With a neat sketch explain the working of a platinum resistance thermometer. (10)
- 13 Explain the working of a turbine flow meter. (10)
- 14 Explain the working of a capacitance type level gauge. (10)

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