

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

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

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| 1 | (a) Explain the various properties of Helium IV? | (5) |
| | (b) Explain how the ultimate and yield strengths of engineering materials change with cryogenic temperature? | (5) |
| 2 | (a) What is Debye characteristic temperature? | (3) |
| | (b) What is super conductivity? | (3) |
| | (c) Explain the application of cryogenics in the field of electronics industry. | (4) |
| 3 | (a) Explain the significance of inversion temperatures of gases. | (3) |
| | (b) Illustrate the working of a simple cascade gas liquefaction system. | (3) |
| | (c) Explain the working of Precooled Linde Hampson System? Derive the expression for liquid yield for the precooled system. | (4) |
| 4 | (a) Compare Claude Liquefaction system and Linde Hampson Liquefaction systems. | (4) |
| | (b) Explain the use of a precooling system in Linde Hampson gas liquefaction systems. | (3) |
| | (c) Draw and explain the T-P diagram for a real gas. | (3) |

PART B

Answer any three full questions, each carries 10 marks.

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| 5 | (a) With a neat sketch, explain any one system for the liquefaction of Hydrogen. Derive expressions for liquid yield and work of liquefaction. | (8) |
| | (b) Name the important critical components of gas liquefaction systems. | (2) |
| 6 | (a) Explain the significance of heat exchanger effectiveness on the performance of a cryogenic liquefier. | (5) |
| | (b) What is the significance of ortho to para conversion during the liquefaction of hydrogen? | (5) |
| 7 | (a) Prove that COP of an ideal Stirling cycle refrigerator is same as that of Carnot | (4) |

refrigerator.

- (b) Explain the working of Claude refrigerator. Derive an expression for COP assuming that the expander work is utilized to compressor the gas. (6)
- 8 (a) With a neat sketch and T-S diagram, explain working of Philips refrigerator. (5)
- (b) Explain the working of a dilution refrigerator with neat schematic. (5)

PART C

Answer any four full questions, each carries 10 marks.

- 9 (a) What is vapour shielding in cryogenic vessels? (4)
- (b) Write short notes on insulations used in cryogenic applications. (6)
- 10 With neat sketches explain the functions of the different components of a typical Dewar vessel. (10)
- 11 Explain the various features of cryogenic fluid transport system. (10)
- 12 a) Explain any one pressure measurement system used in cryogenic applications. (5)
- b) Write a short note on liquid level gauges. (5)
- 13 a) Discuss the instrumentation systems used in cryogenic applications. (5)
- b) With neat sketch explain any three types of heat exchangers used in cryogenic systems. (5)
- 14 Illustrate the working of constant volume gas thermometer? (10)
