

**GUJARAT TECHNOLOGICAL UNIVERSITY****ME - SEMESTER-III • EXAMINATION – WINTER • 2014****Subject Code: 731002****Date: 27-11-2014****Subject Name: Advanced Cryo Coolers****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Classify Cryocoolers. State Cryocooler applications **07**  
 (b) Write advantages of G-M Cryocooler. With usual notations, explain Design of 2-stage G-M Cryorefrigerator. **07**
- Q.2** (a) Explain valve timing effect on performance of 4 K pulse tube Cryocooler. **07**  
 (b) Write the principle of Pulse tube Cryocooler. Explain thermoacoustically driven pulse tube Cryocooler. **07**
- OR**
- (b) Discuss difference between recuperative and regenerative Cryocooler with suitable examples. **07**
- Q.3** (a) Differentiate between three different geometries for pulse tube Cryocoolers with their merits and demerits. **07**  
 (b) Explain working of Stirling Cryocooler. Explain First order analysis of Stirling cycle. **07**
- OR**
- Q.3** (a) Write note on : **08**  
       (1) Miniature Stirling Cryocooler (2) Regenerator material  
 (b) Write short note on Cryocooler reliability **06**
- Q.4** (a) Write short note on : **08**  
       (a) Linear compressor Cryocooler (b) Sorption compressor  
 (b) Explain construction and working of a typical rotary valve used for PTR with neat figure. **06**
- OR**
- Q.4** (a) Describe the Cool-down characteristic of J-T Cryocooler with different supply pressure, temperature and mass flow rate of working fluid. **07**  
 (b) Write Brief Overview of Advanced Cryocoolers. **07**
- Q.5** (a) Describe working of  $\text{He}^3\text{-He}^4$  dilution Cryocooler to attain the temperature of 0.040 K in mixing chamber with schematic diagram. **07**  
 (b) Explain construction and working of a typical Magnetic Refrigerator with necessary diagrams. **07**
- OR**
- Q.5** (a) Explain in brief Loss analysis of Stirling cryocooler. **07**  
 (b) Enlist the suitable assumptions to be made while designing the cryocooler. Discuss the generalized design procedure of a cryocooler. **07**

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