Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– III • EXAMINATION – SUMMER 2015

Subject Code: 731002 **Date: 02/05/2015**

Subject Name: Advanced Cryo Coolers

Time: 2:30 pm to 5:00 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) Describe the methodology of loss analysis of basic pulse tube cryocooler. 07

(b) Describe different applications of cryocoolers. 07

Q.2 (a) Describe the Cool-down characteristic of J-T Cryorefrigerator with different supply pressure, temperature and mass flow rate of working fluid. 07

(b) Describe the working of Ideal Stirling Cycle with necessary diagrams. Also draw the displacement diagrams for displacer and piston. 07

OR

(b)Enlist several types of insulation that can be used in cryogenic equipments. Also give comparison of Gas filled powders/fibers insulation and expanded foam insulation. 07

Q.3 (a) Describe selection procedure of gas mixture components for MR J-T cryocooler. 07

(b) Explain briefly on working of (i) Sorption compressor, (ii) Electrochemical compressor used for cryocoolers. 07

OR

Q.3 (a) Explain the effects of phase angle, frequency and regenerator material on the performance of the Two Stage G-M cryocooler. 07

(b) Explain characteristics of double inlet pulse tube cryocooler 07

Q.4 (a) Explain with necessary figures the Thermodynamic Nonsymmetry Effect on pulse tube refrigerator. 07

(b) Explain about monolithic regenerator and multilayered regenerators with necessary figures. 07

OR

Q.4 (a) Describe liquefaction of nitrogen using mixed refrigerant Processes. 07

(b) Describe about valve timing and its effect on performance of 4 K pulse tube refrigerator. 07

Q.5 (a) Write on applications of cryocoolers for military and medical along with suitable examples. 07

(b) Describe development and utility of magnetic hydrogen liquefier 07

OR

Q.5 (a) Explain characteristics of miniature cryocoolers for space craft applications. 07

(b) Write a note on modern trends in throttle cooler operating with mixed gas 07
