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***B.Tech. Degree VI Semester Examination in  
Marine Engineering May 2017***

**MRE 1605 MARINE REFRIGERATION AND AIR CONDITIONING  
(2013 Scheme)**

Time: 3 Hours

Maximum Marks: 100  
(5 × 20 = 100)

- I. (a) Explain with the help of a neat sketch, the working of an ammonia-water absorption refrigeration system. (10)
- (b) Discuss the effect of the following on COP of a vapour compression refrigeration system: (5×2=10)
- (i) Use of flash chamber.
  - (ii) Sub-cooling of liquid refrigerant using vapour refrigerant.
  - (iii) Sub-cooling by external cooling source.
  - (iv) Variation in suction pressure
  - (v) Variation in discharge pressure.

**OR**

- II. (a) Sketch and explain a simple vapour compression refrigeration system along with the p-H and T-S diagrams. (8)
- (b) For a vapour compression refrigeration system, discuss the following with the help of a p-H diagram: (6×2=12)
- (i) Work of compression.
  - (ii) Heat rejection.
  - (iii) Refrigerating effect.
  - (iv) Coefficient of performance.
  - (v) Mass flow rate.
  - (vi) Compressor power.

- III. (a) Write short notes on: (3×4=12)
- (i) Effect of refrigerants on environment.
  - (ii) Montreal protocol.
  - (iii) New refrigerants.
- (b) Sketch and explain a compound refrigeration system with multi-stage compression and a flash chamber. (8)

**OR**

- IV. (a) Enumerate the desirable properties of a refrigerant. (12)
- (b) Briefly explain how to arrive at the total heat load for which a refrigeration plant has to be designed. (8)

- V. (a) Explain the functions of a throttling device in a refrigeration systems. With the help of a neat sketch explain the working of a thermostatic expansion valve. (8)
- (b) Explain the various control and safety equipment used in a refrigeration system with the help of relevant sketches. (12)

**OR**

(P.T.O.)

- VI. (a) Write short notes on: (2×4=8)  
 (i) Refrigeration of cargo holds.  
 (ii) Container ship refrigeration.
- (b) Explain reverse cycle defrosting and hot gas defrosting methods used in a refrigeration system with the help of neat sketches. (12)
- VII. (a) With respect to a mixture of ideal gases, deduce from equation of state for the ideal gas and gas laws, the following: (2×4=8)  
 (i) Equivalent molecular weight of the gas mixture.  
 (ii) Gas constant of the mixture.
- (b) Draw a skeletal psychrometric chart showing the various constant parameter lines. Explain the various psychrometric properties of moist air. (12)
- OR**
- VIII. (a) State the following with respect to an ideal gas mixture. (3×4=12)  
 (i) Dalton's law (ii) Amagat's law (iii) Gibb-Dalton's law.
- (b) Discuss the following: (2×4=8)  
 (i) The purpose and working of a cooling tower.  
 (ii) Volumetric and gravimetric analysis of gas mixtures and conversion of one to the other.
- IX. (a) Sketch and describe a zone control type air conditioning system used in a ship. (8)
- (b) Explain in detail how heat load calculation of an air conditioning plant is done. (12)
- OR**
- X. (a) Describe how balancing of temperature and air quantity is done before commissioning of an air-conditioning system. (6)
- (b) Write short notes on: (2×7=14)  
 (i) Design and construction of ducts.  
 (ii) Different types of fans used in air conditioning system.