B.Tech. Degree VI Semester Examination in Marine Engineering May 2018

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

Time : 3 Hours   Maximum Marks : 100

$(5 \times 20 = 100)$

I. (a) Sketch and explain a simple vapour compression refrigeration system along with the p-H and T-S diagrams.   (8)

   (b) Discuss the effect of the following on COP of a vapour compression refrigeration system: $(4\times3=12)$
        (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 and discharge pressures.

OR

II. (a) Write short notes on :   (8)
        (i) Cryogenics and its application.   (ii) Cryogenic insulation.

   (b) For a vapour compression refrigeration system, discuss the following with the help of a p-H diagram: $(6\times2=12)$
        (i)   Work of compression.   (ii) Heat rejection.
        (iii) Refrigerating effect.   (iv) Coefficient of performance.
        (v)   Mass flow rate.   (vi) Compressor power.

III. (a) Discuss the various factors affecting the cooling load of a refrigeration plant and briefly explain how to arrive at the total heat load of a refrigeration plant.   (12)

   (b) Discuss the application of refrigeration system in liquefied gas carriers.   (8)

OR

IV. (a) Sketch and explain a compound refrigeration system with multi-stage compression and a flash chamber.   (8)

   (b) Write short notes on : $(3\times4=12)$
        (i)   Effect of refrigerants on environment.
        (ii)   Montreal Protocol.
        (iii) New refrigerants.

V. (a) With the help of a neat sketch explain the working of a thermostatic expansion valve used in a vapour compression refrigeration system.   (12)

   (b) Sketch and describe a shaft seal used in a refrigeration system compressor.   (8)

OR

VI. (a) With respect to a vapour compression refrigeration system explain the pre-charging procedures and methods of refrigerant charging. (10)

    (b) Explain reverse cycle defrosting and hot gas defrosting methods used in a refrigeration system with the help of neat sketches. (10)

VII. (a) With respect to air and water vapour mixture explain the following terms and highlight the significance of these in air conditioning: (3×4=12)
        (i) Relative humidity, specific humidity and absolute humidity.
        (ii) Dry and wet bulb temperatures.
        (iii) Dew point temperature.

    (b) Explain volumetric and gravimetric analysis of gas mixtures and conversion of one to the other. (8)

OR

VIII. (a) State the following with respect to an ideal gas mixture: (12)
        (i) Dalton's law.
        (ii) Amagat's law.
        (iii) Gibb-Dalton's law.

    (b) Explain the purpose and working of a cooling tower. (8)

IX. Write short notes on : (2×10=20)
        (i) Design and construction of ducts.
        (ii) Different types of fans used in air conditioning system.

OR

X. (a) Sketch and explain single duct system of air conditioning used on ships. (8)

    (b) Explain in detail how heat load calculation of an air conditioning plant is done. (12)

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