

C.U.SHAH UNIVERSITY

Winter Examination-2018

Subject Name : Vehicle Refrigeration and Air Conditioning

Subject Code : 4TE07VRA1

Branch: B.Tech (Automobile)

Semester : 7 Date : 01/12/2018

Time : 10:30 To 1:30

Marks : 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

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- Q-1 Attempt the following questions: (14)**
- a)** The solar heat reaches any part of the earth surface in the form of **01**
(A) Direct radiation (B) Diffuse radiation (C) Both A and B (D) None of them
- b)** In absorption refrigeration systems, the compressor of vapour compression system is replaced by: **01**
(A) Absorber (B) Generator (C) pump (D) All of the above
- c)** The useful storage life of food products depends on: **01**
(A) Storage temperature (B) Moisture content in the storage (C) Condition of food products at the time of storage (D) All of the above
- d)** Hermetic compressors are used mainly in smaller systems as they: **01**
(A) Yield higher COP (B) Do not require frequent servicing (C) Offer the flexibility of using any refrigerant (D) Can be used under different load conditions efficiently
- e)** The chemical formula of refrigerant R11 is: **01**
(A) $CClF_3$ (B) CHF (C) CCl_3F (D) CClHF
- f)** The regenerative air cooling system has _____ number of cooling turbine. **01**
(A) 0 (B) 1 (C) 2 (D) 3
- g)** For the saturated air relative humidity is **01**
(A) 0 % (B) 50 % (C) 75 % (D) 100 %
- h)** If by-pass factor of coil is 0.99, the efficiency of coil is **01**
(A) 0.1 (B) 0.2 (C) 0.01 (D) 0.02
- i)** Air conditioning is required in the manufacture of precision parts to: **01**
(A) Achieve close tolerances (B) Prevent rust formation (C) Provide clean environment (D) All of the above
- j)** Define the term "tonne of refrigeration". **01**



- k) Give the chemical formula of R-12. 01
- l) Define COP of refrigeration systems. 01
- m) What is dew point temperature? 01
- n) Define: Aspect Ratio 01

Attempt any four questions from Q-2 to Q-8

- Q-2 Attempt all questions (14)**
- (a) Explain Reversed brayton cycle with p-v and T-s diagram. 07
 - (b) The atmospheric air at pressure 1 bar and -5°C is drawn in the cylinder of the compressor of a Bell-coleman refrigerating machine. It is compressed isentropically to a pressure of 5 bar. In the cooler, the compressed air is cooled to 15°C , pressure remaining the same. It is then expanded to a pressure of 1 bar in expansion cylinder, from where it is passed to the cold chamber. Find : (1) the work done per kg of air, and (2) C.O.P of the plant.
For assume law of expansion, $pv^{1.4} = \text{Constant}$ and specific heat of air at constant pressure = 1 KJ/Kg K. 07
- Q-3 Attempt all questions (14)**
- (a) Explain working of simple air evaporative cycle cooling system used in aircraft with neat sketch. 07
 - (b) Explain mechanism of Simple vapour compression refrigeration system with neat sketch. 07
- Q-4 Attempt all questions (14)**
- (a) Explain practical aqua-ammonia ($\text{NH}_3\text{-H}_2\text{O}$) Vapour Absorption System. 07
 - (b) Discuss ideal properties of Refrigerant and also give applications of refrigerant. 07
- Q-5 Attempt all questions (14)**
- (a) Explain the concept of sensible heat factor and bypass factor with suitable sketches? 07
 - (b) For a sample of air having 22°C DBT, relative humidity 30 % at barometric pressure of 760 mm of Hg, Calculate 07
 1. Vapour Pressure,
 2. Humidity ratio,
 3. Vapour Density,
 4. Enthalpy
- Q-6 Attempt all questions (14)**
- (a) Enlist the different types of pressure losses in ducts and explain any one. 07
 - (b) A rectangular duct section of 500 mm * 350 mm size carries $75\text{ m}^3/\text{min}$ of air having density of 1.15 kg/m^3 . Determine the equivalent diameter of a circular duct if (i) the quantity of air carried in both the case is same, and (ii) the velocity of air in both the case is same.
If $f = 0.01$ for sheet metal, find the pressure loss per 100 m length of duct. 07
- Q-7 Attempt all questions (14)**
- (a) Explain the sensible heat gain and latent heat gain. 07
 - (b) Explain the automotive heaters and automotive temperature control. 07
- Q-8 Attempt all questions (14)**
- (a) Classify air conditioning system and explain any one. 04
 - (b) Describe thermostats for air conditioning control devices. 04
 - (c) Explain in brief the following : (1) Filters (2) Humidifiers used in air conditioning systems. 06

