

**B.Tech Odd Semester (CBCS) Exam.,
December—2016**

AGRICULTURAL ENGINEERING

(7th Semester)

Course No. : AE-701

(Refrigeration and Air-conditioning)

Full Marks : 75

Pass Marks : 30

Time : 3 hours

- Note :*
1. Attempt **one** question from each Unit.
 2. Begin each answer in a new page.
 3. Answer parts of a question at a place.
 4. Assume reasonable data wherever required.
 5. The figures in the margin indicate full marks for the questions.

UNIT—I

- 1. (a)** What is psychrometry? 1
- (b)** Explain all the important psychrometric processes with proper diagram. 14

- 2. (a)** What are the important psychrometric properties? 3
- (b)** What is comfort? What are the uses of comfort chart? 3
- (c)** Define dewpoint temperature and hygroscopic materials. 2+2=4
- (d)** What is specific humidity? When does it become maximum? 3
- (e)** What do you understand by saturated air and unsaturated air? 2

UNIT—II

- 3. (a)** What is refrigerant? Elaborately explain about all the thermodynamic properties of refrigerants. 2+8=10
- (b)** What are primary and secondary refrigerants? 2
- (c)** What are refrigeration effect and coefficient of performance? 3
- 4. (a)** What is Carnot cycle? Explain about all the steps involved in Carnot cycle. 2+8=10
- (b)** What is Bell-Coleman cycle? What are the advantages and disadvantages of Bell-Coleman cycle? 5

(3)

UNIT—III

5. (a) What is vapour compression refrigeration system? What are the processes involved in vapour compression refrigeration system? 2+4=6
- (b) What are the differences between gas cycles and vapour cycles? 4
- (c) What are the practical difficulties with Carnot refrigeration system? 5
6. (a) What is condenser? What are the different types of condensers? 3
- (b) Explain about different types of water-cooled condensers. 6
- (c) Define the following : 6
- (i) Natural and forced convection-type evaporators
- (ii) Shell- and coil-type evaporators
- (iii) Plate-type evaporators

UNIT—IV

7. (a) What are the advantages and disadvantages of steam jet refrigeration systems? 6

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(Turn Over)

(4)

- (b) What is thermoelectric refrigeration? Why are thermoelectric coolers used for cooling? 2+4=6
- (c) What are the disadvantages of thermoelectric cooling? 3
8. (a) Elaborately explain about the basic principles behind a typical thermoelectric cooling. 7
- (b) What are the different thermoelectric materials? 3
- (c) Define the following : 5
- (i) Vortex tube refrigeration systems
- (ii) Absorption refrigeration systems

UNIT—V

9. (a) What are the criteria need to satisfy while selecting air-conditioning systems? 4
- (b) Define humidifier and dehumidifier. 3
- (c) What are the informations required to calculate cooling and heating loads? 4

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(Continued)

(d) A building has a U-value of $0.5 \text{ W/m}^2\text{K}$ and total exposed surface area of 384 m^2 . The building is subjected to an external load (only sensible) of 2 kW and an internal load of 1.2 kW (sensible). If the required internal temperature is $25 \text{ }^\circ\text{C}$, state whether a cooling system is required or a heating system is required when the external temperature is $3 \text{ }^\circ\text{C}$. How will the results change, if the U-value of the building is reduced to $0.36 \text{ W/m}^2\text{K}$? 4

10. (a) What are the various components that constitute the cooling load on a building? How will you calculate the cooling load? 7

(b) What are the parameters required to know for the estimation of internal and external loads? 3

(c) What are the classifications of air-conditioning systems based on the use of fluid media? What are the advantages and disadvantages of air-water systems? 5

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