

**BACHELOR OF ARCHITECTURE EXAMINATION, 2019**  
**(B. Arch. 3<sup>rd</sup> year 2<sup>nd</sup> Semester)**

**SUBJECT: SERVICES & EQUIPMENT- II**

Time : Three hours

Full Marks: 100

Instructions: Answer for 100 marks. Use sketches wherever necessary

Q.01. Draw a schematic diagram and label different parts of a Refrigeration cycle. Explain how this acts as the basic governing principle of Air conditioning. Discuss the properties of a 'refrigerant'.

Discuss the conditions of comfort. With respect to suitability, discuss in brief the characteristics of any two types of Air conditioning used in the Hotel buildings.

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Q.02. Describe in detail the various sources of heat that are taken into account for estimation and calculation of 'cooling load' in airconditioning. Cite examples.

**Given:**

Ventilation air: 3000 cfm

Outdoor temperature: 85 F and 50% RH

Indoor temperature: 70 F and 45% RH

Using appropriate mathematical formulae, calculate (a) Ventilation air sensible cooling load in Btu/hr and (b) Ventilation air Latent cooling load in Btu/hr

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Q.03. With the help of suitable sketches, describe the various kinds of ducting arrangement in air conditioning. Citing a suitable numerical example, show how the duct sizing is calculated. Explain the flexibilities offered by the standard charts and formulae in sizing of ducts of equivalent cross-sectional areas. Describe how and under which situations air conditioning ducts can be partially or fully avoided without compromising indoor comfort. Use sketch plan of a couple of spaces to elucidate.

**Given:** Unconditioned space DBT: 95F, Unconditioned space WBT: 70F, Cold air Supply Duct Temperature: 65F. Find Dew Point Temperature and determine whether condensation will form on the Duct

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Q.04. With the help of suitable sketches, describe the function and working principle of a 'Cooling Tower'. Describe an 'Air-cooled' and 'Water-cooled' Condenser. Describe the working principle of a 'Ductable' Air conditioning system and a 'Non-ductable' Air conditioning system. In light of system-integration, compare and contrast a 'Window air conditioner' and a 'Split Air conditioner'.

Describe the working principles of a 'Liquid Chiller' system for Air conditioning.

Describe a VRF (or VRV) type of Air conditioning. Describe its advantages over a few other systems.

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Q.05. (a) Draw sketch views of 'Psychrometric Chart' to describe the various curves and their significances in dealing with the properties of air.

(b) Draw, label, describe and explain how air is conditioned using the principle of 'Refrigeration Cycle'.

Solve the following:

Given: Air required in main supply duct: 6000 cfm  
Air velocity permitted: 1600 fpm (This is well within the maximum velocity permitted for general office)  
Length of main supply duct: 120 ft.

Find: (i) Main supply duct size &  
(ii) Friction loss

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06. What do you understand by the term "Enthalpy"?  
Describe (a) the process of cooling and dehumidification and (b) Heating and humidification

Given: Initial DBT: 95F  
Initial WBT: 80F  
Final DBT: 55F  
Final WBT: 45F

Find: A. Sensible heat removed  
B. Latent heat removed and  
C. Total heat removed  
Calculation should be supported by Psychrometric chart

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07. Answer any five:

(5X5)= 25

- (i) HVAC
- (ii) ASHRAE & ISHRAE
- (iii) Equal friction method
- (iv) Diffusers and Registers relating to ducting in airconditioning
- (v) AHU and FCU
- (vi) Dampers
- (vii) CFM
- (viii) Infiltration
- (ix) Heat exchanger
- (x) Enthalpy