Ref. No. EX/ARCH/T/421/2017(OLD)

B.Arch. Eng. Examination, 2017

(4th Year, 2nd Semester, Old)

ENVIRONMENTAL SYSTEMS

Full Marks: 100 Time: Three Hours

The figures in the margin indicate full marks

*Question **No.1 is compulsory** and to answer **any 5 (Five)** from the remaining questions*

Q1.

I. **Fill in the Blanks:** 10

i. For a person of 1.7m height and 70 kg body mass, the DuBois Area is_____m^2

ii. The dry-bulb or 'true air temperature' is a value taken in the shade, the thermometer being mounted inside a louvered wooden box, known as the _____

iii. The average of each day's maximum and minimum and then the average of the 30 days' average is known as _____

iv. _____is defined as the non- directional quantity of light.

v. An average 100 watt light bulb produces _____lumens.

vi. For reading and easy office works the Daylight Factor range should be _____%.

vii. The unit of Luminance is _____

viii. If the head height above work plane is 2.1m, the daylight penetration would be ____m.

ix. The _____ system, is a fixed system, consists of numerous equally spaced, three-sided, reflective louvers placed inside a double glazed unit.

x. The Daylight Factor for a room with 320 lux in Kolkata would be _____.

II. i. In the given Psychrometric chart for DBT of 35°C and RH of 50%, show the values of WBT, Dew point, Absolute Humidity, Vapour Pressure & Enthalpy. 05

ii. In the given Psychrometric chart, the temperature and humidity of one year for a particular location is plotted. What are the Design strategies you would suggest for achieving thermal comfort. Explain with sketches . 10

Q2.

i. Define 1 Clo. 3

ii. Explain three types of Wind Rose diagram used for architectural design. 6

iii. Explain Predicted Mean Vote (PMV) and its importance in Thermal Comfort study. 6

Q3.

i. Describe the concept of PDEC with sketches. 3

ii. Explain EAT and its importance in environmental Design? 3

iii. What is a Solar Chimney and its role in passive design? 3

iv. Thermal Mass and its importance 3

v. Explain Urban Microclimate and its Design Aspects. 3

Q4. For the given conditions

i. DBT= 30^0C, WBT =28^0C, T_g =32 ^{0}C & Air Velocity of 1 m/sec (3+3+2+2 =10)

a. Calculate the Tropical Summer Index value

b. Calculate the MRT

c. For warm climate with lighter clothing, calculate Perceived Environmental Temperature.

d. For Cold climate with heavier clothing, calculate Perceived Environmental Temperature.

ii. Explain the importance of Bioclimatic Chart in sustainable Building Design. 5

Q5.

i. For a window of size of 1800mm x 1200mm &
For Sun position at 9.00 hrs, Altitude=18.5 Deg., Azimuth=130.5 Deg.
For Sun position at 16.00 hrs, Altitude =21.6 Deg., Azimuth=-134.2 Deg.
Calculate and Design the shadings for the southern façade with the given data. 10

ii. Explain the concept of louver design for Western Façade and South Eastern Façade. 5

Q6.

i. Define 1(one) candela 2

ii. Differentiate between Illuminance & Luminance 3

iii. What are the strategies to reduce Glare? Explain with sketches 10

Q7. Write Short notes on with sketches

i. Prismatic panels and their importance in Daylighting design? 3

ii. Anidolic zenithal openings importance in Daylighting design? 3

iii. Laser-cut panels in Daylighting design 3

iv. Light Guiding Shades 3

v. Heliostat for Daylighting 3

Q8.

i. What do you mean by Daylighting Fixtures? Explain with examples and sketches. 5

ii. For openings without any shading devices, explain the Daylighting system concepts types for Diffuse light only. 10