BRAC University
Dept. of Computer Science and Engineering

Quiz 2: **20 min**
Full Marks: **10**
SET **A**

Semester: Fall 2023
Course Code: CSE251
Section: **15**
Course Name: **Electronic Devices and Circuits**

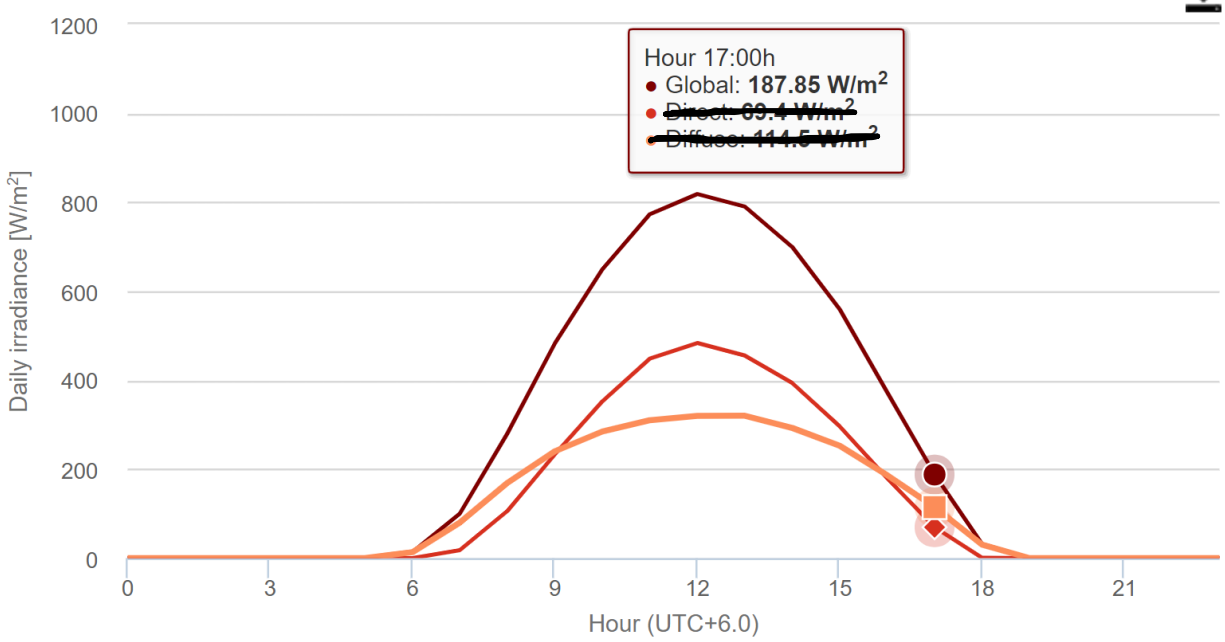
Name: _____

Student ID: _____

- ✓ No washroom breaks. Phones must be turned off. Using/carrying any notes during the exam is not allowed.
- ✓ At the end of the exam, the **exam script** must be returned to the invigilator.
- ✓ Marks allotted for each question are mentioned beside each question.
- ✓ Write your answers inside the indicated boxes (where applicable). If you run out of room for an answer, please continue on the back of the page".
- ✓ Symbols have their usual meanings.

Question 1: 10 Marks

[CO2]



The above figure shows the variation of daily average solar irradiance (in units of $\mathbf{W/m^2}$) throughout the day in Bangladesh. In the legend, we can see that at **17:00h,** the (global) solar irradiance is about $\mathbf{187.85\ W/m^2}$

A photodetector module that produces a voltage V_S across its terminal as per the following relation, is used to convert (global) solar irradiance G (in units of $\mathbf{kW/m^2}$) to usable voltage.

$$V_S(G) = 6G^2 + 12G + 2$$

You are asked to **design** a circuit using Op-Amp that will be connected to a street-lamp (or an LED) and that will turn the lamp (LED) **ON** after **17:00h**. The lamp (LED) turns **ON** at **5 V,** and remains **OFF** at **0 V**.

i. Determine whether the Op-Amp comparator circuit needed will be in inverting, or non-inverting configuration. 2

ii. Determine the **threshold (reference) voltage** with which the input voltage is compared. 4

iii. Draw the completed Op-Amp comparator circuit. 4

Question 2: 12 Marks

[CO2]

The two lines $\boldsymbol{L_1}$ and $\boldsymbol{L_2}$ signify the two loops in the adjacent circuit. Let input voltage $\boldsymbol{V_{IN}} = 4.0\ \text{V}$.

i. Write the two loop equations along L_1 and L_2 using the quantities $\boldsymbol{I_1}, \boldsymbol{I_2}$ and $\boldsymbol{I_1 + I_2}$.

ii. Solve the two loop equations to find $\boldsymbol{I_1}$ and $\boldsymbol{I_2}$.

iii. Find $\boldsymbol{V_{OUT}}$.