ID:	Name:

Brac University

Semester: Fall 2024
Course Code: CSE251
Electronic Devices and Circuits
Section: 01-28

Set 01

Assessment: *Midterm Exam*
Duration: 1 hour 15 minutes
Date: 22 November, 2024
Full Marks: 30

Instructions: **Answer all the questions** and read the questions carefully.

■ Question 1 of 3 *[CO1] [6 marks]*

(a) **[1.5 marks]** **State** the assumptions for the parameters of an ideal op-amp.

(b) **[1 mark]** **State** the equation of the output of an op-amp integrator circuit.

(c) **[1.5 marks]** Why is a diode considered a non-linear device? **Explain** briefly.

(d) **[2 marks]** **State** the conditions to verify the assumptions regarding the operating states of the CVD model of a diode.

■ Question 2 of 3 *[CO2] [11 marks]*

(a) **[5 marks]** **Analyze** the circuit in *Figure-1*, and **calculate** the value of V_X. Now, **draw** the waveform of V_O, and **label** the graph properly.

(b) **[5 marks]** **Analyze** the circuit in *Figure-2*, and **calculate** V_X, V_Y, I_{D1}, and I_{D2} using the method of assumed states. You must **validate** your assumptions. Use $V_{D0} = 0.7$V for both diodes.

(c) **[1 mark]** **Analyze** the circuit in *Figure-3*, and **determine** the boolean logic function, f with the boolean inputs x, y, z. **Assume**, ideal diodes are used here.

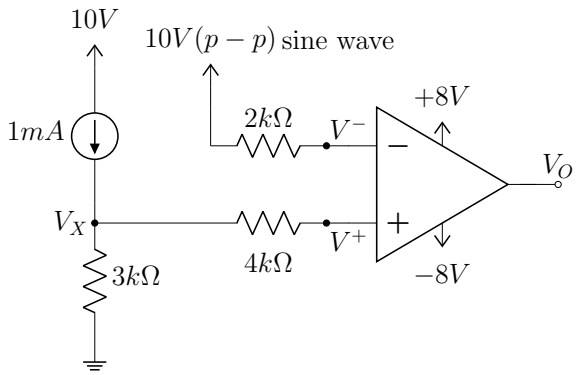

Figure-1

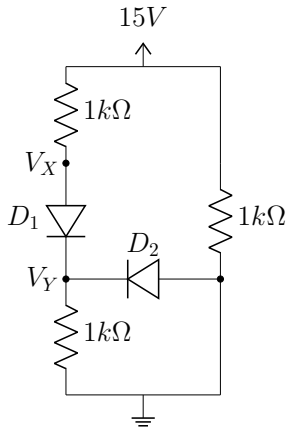

Figure-2

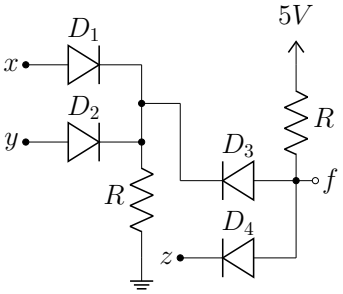

Figure-3

■ Question 3 of 3 *[CO3] [13 marks]*

(a) **[6 marks]** **Design** a device to implement the following function, f where x, y, and z are the inputs of the device. **Assume** any value if necessary.

$$f = \frac{d^2x}{dt^2} + 10y + \int (10z - 9)dt$$

(b) **[3 marks]** **Design** the circuits with the boolean inputs A, B, C, D using Ideal Diodes to implement the following boolean logic functions,

1. $f = A + C + B.D$
2. $f = A.C + B + D$

(c) **[2 marks]** **Analyze** the graph in *Figure-4*, and **design** a circuit that implements the relationship between the voltage waveforms, V_{input} and V_{output}. **Assume** any value if necessary.

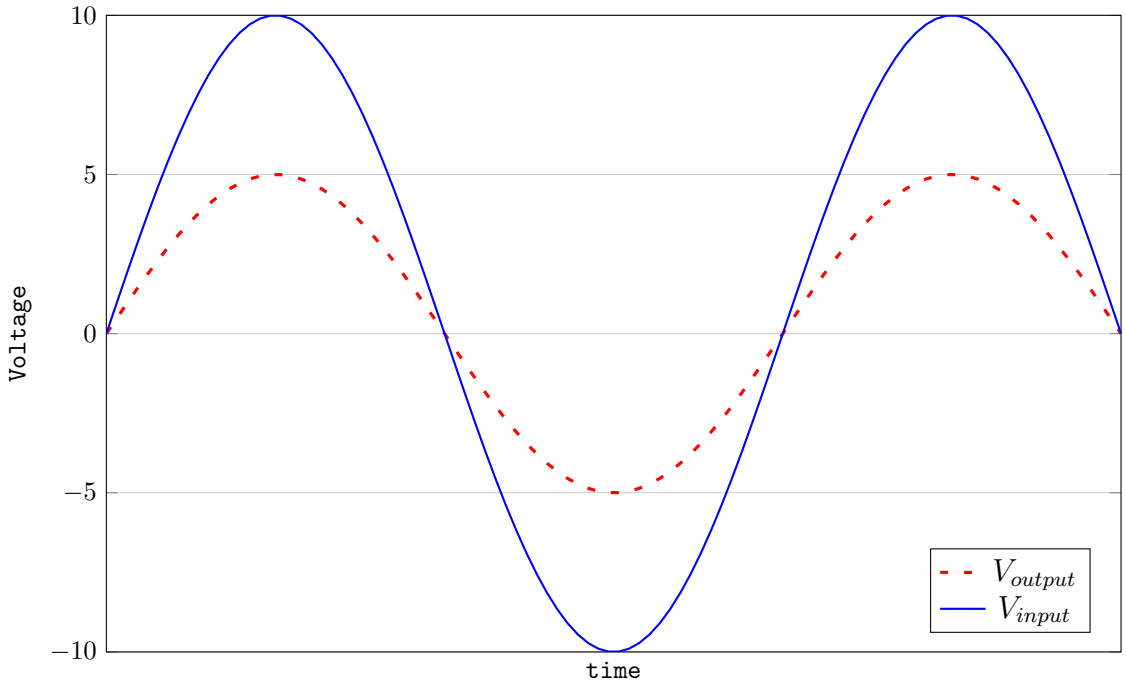

Figure-4

(d) **[2 marks]** Now, **modify** the circuit you designed in the previous question so that $V_{output(modified)}$ represents the output waveform of the modified circuit as shown in *Figure-5*. **Assume** any value if necessary.

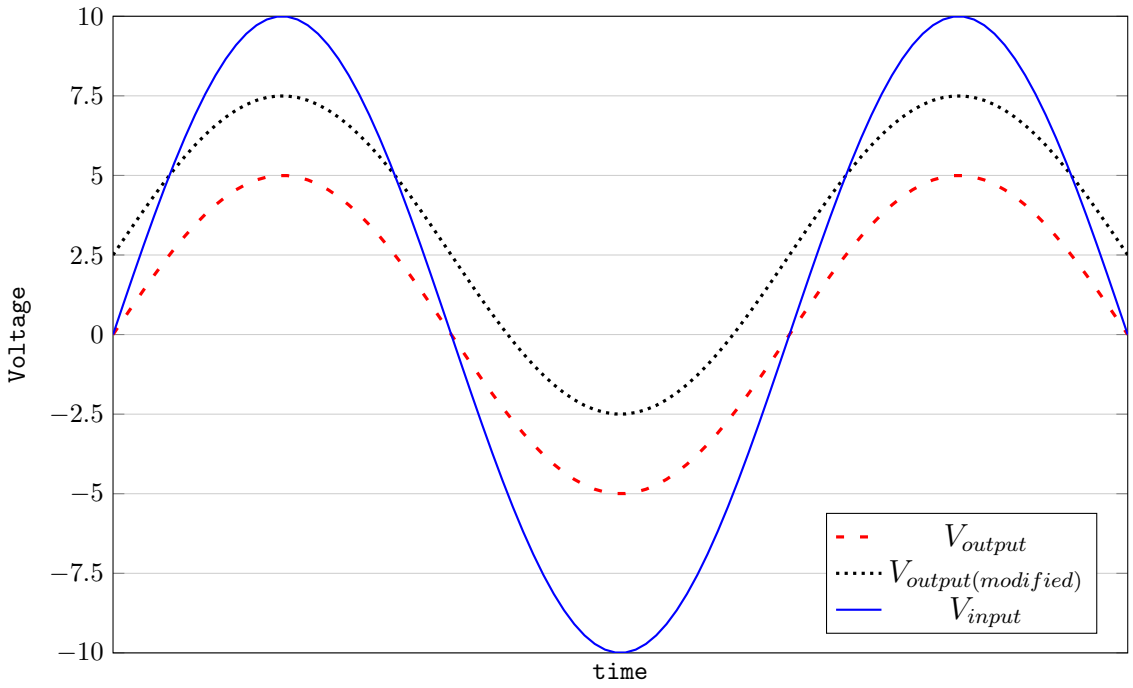

Figure-5