KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER
MAIN EXAMINATIONS

FOR THE DEGREE OF B.SC (RENEWABLE ENERGY AND BIOFUELS TECHNOLOGY)

COURSE CODE: REN 213

COURSE TITLE: BASIC ELECTRONICS TECHNOLOGY

DATE: 19/12/2022 **TIME:** 2:00-4:00PM

INSTRUCTIONS TO CANDIDATES

TIME: 2 Hours

Answer question ONE and any TWO of the remaining

Question One (Compulsory)

a) Define the term 'doping' as used in semiconductors. (2 marks)

b) What is meant by contact potential in a P-N junction? (3 marks)

c) State two reasons for biasing a transistor (2 marks)

d) State three main properties of an op-amp. (3 marks)

e) Define common-mode rejection ratio of an op-amp. (2 marks)

f) Define the following terms as used in filters. (5 marks)

i) Attenuation

ii) Cut-off frequency

iii) Propagation constant

iv) High pass filter

v) Band-stop filter

g) Name any **THREE** types of number systems. (3 marks)

h) Define a logic gate (2 marks)

i) State **FOUR** types of logic gates. (4 marks)

j) Briefly explain any **FOUR** types of flip-flops. (4 marks)

Question Two

a) With aid of a diagram, describe the operation of a NPN bipolar junction transistor. (8 marks)

b) With the aid of a labelled diagram, describe the formation of a p-type semiconductor. (2 marks)

c) With the aid of a labelled construction diagram, describe the operation of an n-channel depletion MOSFET and sketch its output characteristic curves. (10 marks)

Question Three

a) For the summing op-amp shown in figure 1, determine the output voltage, V_0. (10 marks)

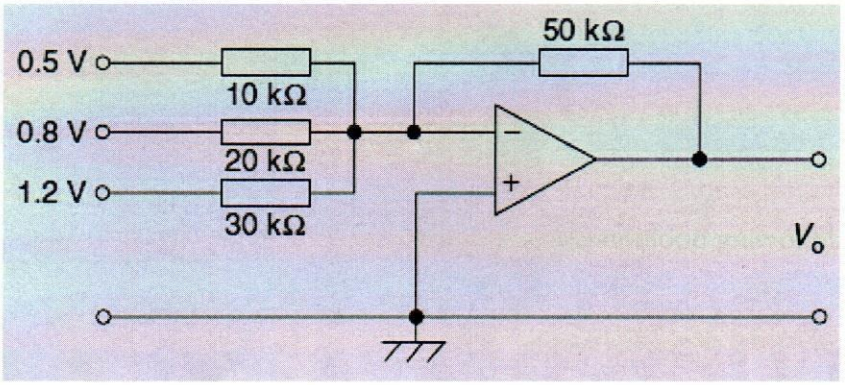

Figure 1

b) Determine the cut-off frequency and the nominal impedance for the low-pass T-connected section shown in figure 2. (10 marks)

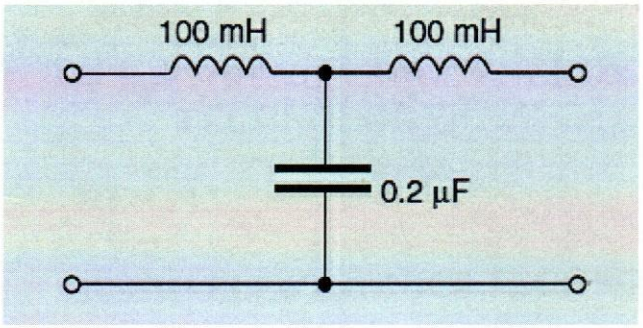

Figure 2

Question Four

a) Convert 11001_2 to its equivalent decimal number. (6 marks)

b) State **THREE** uses of octal number system. (3 marks)

c) Figure 3 below shows a three input OR gate. Draw its truth table. (6 marks)

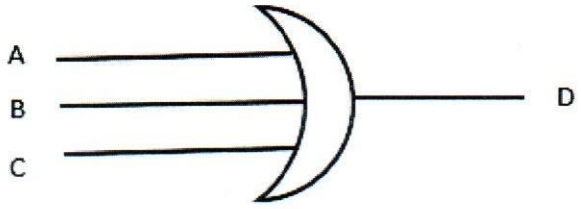

Figure 3

d) List any **FIVE** applications of logic gates. (5 marks)

Question Five

a) Simplify the following Boolean expression and draw the logic circuit for the simplified expression. (6 marks)

$$Y = \bar{A}BC + A\bar{B}C + ABC + B\bar{C}$$

b) A Boolean expression is given by; (14 marks)

$$Y = \bar{A}BC + ABC + B\bar{C}D$$

i) Obtain a truth table for the expression.

ii) Simplify the expression using Karnaugh map.