

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
 ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Semester Final Examination

Course No.: EEE 4261

Course Title: **Electrical and Electronic Technology II**

Summer Semester, A. Y. 2021-2022

Time: 3 Hours

Full Marks: 150

There are **5 (five)** questions. Answer all **5 (five)** questions. The symbols have their usual meanings. Programmable calculators are not allowed. Marks of each question and corresponding COs and POs are written in the brackets. **If there is any missing value, make suitable assumptions.**

1. a) Sketch cross sectional view of a n-type MOSFET and label it's different terminals. 10
(CO1, PO1)
- b) Derive expression of drain current i_{DS} of n-type MOSFET for small v_{DS} . 10
(CO1, PO1)
- c) Determine the values of R_D and R_S in **fig:1**, so that the transistor operates at $I_D = 0.4$ mA and $V_D = +0.5$ V. The NMOS transistor has $V_t = 0.7$ V, $\mu_n C_{ox} = 100 \mu\text{A}/\text{V}^2$, $L = 1 \mu\text{m}$, and $W = 32 \mu\text{m}$. 15
(CO2, PO2)

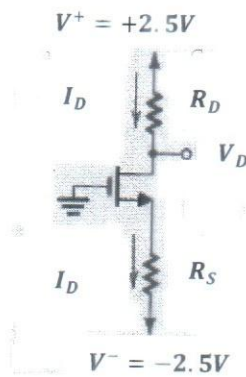


fig: 1

2. a) Explain how XOR gate can be implemented using universal gate (either NAND gate or NOR gate) only. 10
(CO1, PO1)
- b) Derive Boolean expression of logic function f from the Karnaugh map in **Table: 1** and implement the logic circuit. 15
(CO2, PO2)

AB \ CD	00	01	11	10
00	1	0	1	1
01	0	0	0	0
11	0	0	0	0
10	1	0	1	1

Table: 1

3. a) Sketch the circuit symbol of an Op-Amp and mention its different pins and their functionality. 10
(CO1, PO1)
- b) Explain an Op-Amp circuit which will convert a square signal into a triangular signal. Also derive the relation between the input signal (V_{in}) and output signal (V_{out}). 20
(CO2, PO2)
4. a) A given system has four sensors that can produce an output of 0 or 1. The system operates properly when exactly one of the sensors has its output equal to 1. An alarm must be raised when two or more sensors have the output of 1. Design the simplest circuit that can be used to raise the alarm. 20
(CO2, PO2)
- b) Implement a 4 x 1 Mux gate using only 2 x 1 Mux gate. 15
(CO2, PO2)
5. a) Explain Ideal and Constant voltage model of a Diode with proper graphs. 10
(CO1, PO1)
- b) Analyze the circuit in **fig: 2** to determine the voltages at all nodes and the currents through all branches. 15
(CO2, PO2)

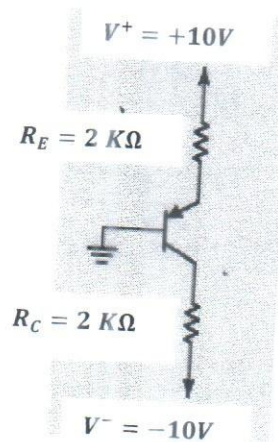


fig : 2