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Karadeniz Technical University
Faculty of Engineering
Dept. of Comp. Engineering
BİL 107 Mid Term Exam

1. Convert single precision $404C0000_{16}$ to floating point decimal notation.

2. A hash function is any algorithm that maps data of a variable length to a data of a fixed length. Many applications use hash functions and cryptography is one of them. It is easy to generate hash values from input data and easy to verify that the data matches the hash, but hard to 'fake' a hash value to hide malicious data.

a. Construct the truth table of a hash function Y=X mod 5 + 3 with 4 bit input $X_3X_2X_1X_0$ and 3 bit output $Y_2Y_1Y_0$

b. Design simplified combinational logic circuit to compute the hash function by Karnaugh mapping.

3. Computer controlled robot arms are used in industry to manufacture precision parts of many products. Error free and precise positioning of the gripper (robot hand) requires optical encoders with gray code output at the joints of the robot arm. Code convertors convert gray code signals from encoders to pure binary signals before they are processed by the computer.

a. Construct the truth table of 3 bit gray code inputs $X_2X_1X_0$ and corresponding pure binary outputs $Y_2Y_1Y_0$ for a gray to binary code convertor,

b. Design simplified combinational logic circuit to convert 3 bit gray code to pure binary code by Karnaugh mapping,

c. Draw the schematic diagram of a convertor to read angular position (rotation) of a robot arm joint with at least 1 degree angular resolution.