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Air University

(Mid-Term Examination: Fall 2024) 241503

Subject: **Application of Information and Communication Technologies**
Course Code: **CS-181**
Class: **BS-CYS-F-24**
Semester: **I**
Section: **A, B**

Total Marks: **50**
Date: **8-11-2024**
Time: **8:00 – 10:00 am**
Duration: **2 Hours**
FM Name: **Jameel Arif**
FM Signatures:

Hod Signatures:

Note:

- **All questions must be attempted.**
- **This examination carries 25% weight towards the final grade.**
- **Return the question paper with the answer sheet**
- **Exchange of calculators is not allowed.**

	Q. No. 1 (CLO 1)	20 Marks
a	How is data stored in computers? Also explain how a simple text string, such as "Hello," is stored. Include the concept of character encoding (e.g., ASCII or You can suppose any custom encoding scheme of 8 bits per character) and how each character corresponds to a unique binary value.	7
b	What are the different types of computers, and how do they vary in terms of purpose, architecture, and functionality? Provide examples for each type.	5
c	Describe the machine cycle involved in executing a single machine-level instruction. Explain each stage {fetch, decode, execute, and store} highlighting the roles of the control unit, ALU, and FPU. How do these stages interact to ensure the successful execution of an instruction? Provide an example to illustrate your explanation.	8
	Q. No. 2 (CLO 2)	**30 Marks**
	Imagine you are a software engineer tasked with developing a new embedded system for a smart home device. The device needs to communicate with various sensors and appliances that use different number systems. Your team is working on a module that handles data input from these devices, and you need to ensure that the module can convert and perform arithmetic operations on data from different sources.	
a	You receive a data signal from a temperature sensor that sends its readings in hexadecimal format. The reading is $1A3F_{16}$. Convert this hexadecimal value to: • Decimal • Binary • Octal	5
b	The device also needs to compare this temperature reading with a threshold value sent in binary format: 11011010_2. Convert the threshold value to decimal and determine if the temperature reading exceeds this threshold.	5

c	After processing the readings, your system needs to add the temperature reading (in binary) to a constant offset for calibration, which is 00001111_2. Show the binary addition and provide the result in both binary and decimal formats.	5
d	The device calculates the average of the temperature reading and a secondary reading, which is 00101000_2 (in binary). Perform the binary multiplication of the temperature reading (in binary) by $(10011)_2$. Show the steps and provide the result in both binary and decimal formats.	5
e	To optimize the system's performance, the device needs to divide the temperature 00101000_2 reading (in binary) by $(010011)_2$. Perform the binary division and provide the result in both binary and decimal formats.	5
f	Finally, the device needs to display the adjusted temperature reading in hexadecimal. Convert the final decimal result from the previous operations back to hexadecimal.	5

********** End of Question Paper **********