CENG111 (2023-2024 Fall) MIDTERM1 -ANSWERS

1) A data collection program receives following sensor data consisting **ASCII characters** over a transmission line and saves this data on the memory of the computer it resides. Suppose that we have a 8-bit computer such that each memory location holds only one ASCII character. Show how this data placed on the memory locations in **hexadecimal** form?

Received sensor data in binary form:

111010010000111100101001011000001011011010001111010100 11

Answer:

Memory:

Location 1		Location 1	**74H**
Location 2		Location 2	**43H**
Location 3		Location 3	**65H**
Location 4		Location 4	**16H**
Location 5		Location 5	**05H**
Location 6		Location 6	**5AH**
Location 7		Location 7	**1EH**
Location 8		Location 8	**53H**

2) Assume three values x, y, z, and t are stored in a machine's memory, 00, 01, 02, 03 addresses, respectively.

a) Assume ALU operations are performed for the values stored in registers. Describe the sequence of events (loading registers from memory, storing values into memory, and so on) for the following code segment (You can choose any number to represent the registers):

t = x + y + z

Answer:
Load x into *R0* from 00 # load x
Load y into *R1* from 01 # load y
Add *R0* and *R1* into *R0* # x+y
Load z into *R2* from 02 # load z
Add *R0* and *R2* into *R0* # x+y+z
Store *R0* into 03 # store t

b) Write the machine language representation of the events you described in (a) by assuming you have the following instructions in the machine language (the same given in the lecture). Note: You can choose any number to represent the registers.

Opcode	**Operand**	**Description**
1	RXY	LOAD the register R with the bit pattern found in the memory cell whose address is XY.
2	RXY	LOAD the register R with the bit pattern XY.
3	RXY	STORE the bit pattern found in register R in the memory cell whose address is XY.

4	0RS	MOVE the bit pattern found in register R to register S.
5	RST	ADD the bit patterns in registers S and T as though they were two's complement representations and leave the result in register R.

***Answer**:*

LOAD R0 with value in 00: **1000**
LOAD R1 with value in 01: **1101**
ADD R0 and R1 into R0: **5001**
LOAD R2 with value in 02: **1202**
ADD R0 and R2 into R0: **5002**
STORE R0 in 03: **3003**

(Many different combinations using different registers may be possible)

3)

Process	Execution Time (ms)
P_1	4
P_2	20
P_3	8
P_4	6

Suppose that the First Come First Served scheduler is used and four processes arrive in the following order: P_1, P_2, P_3, P_4.

a) Calculate the average waiting time for these processes?

Answer:

a) The waiting times for the processes are as follows:

P_1	P_2	P_3	P_3
0	4 ms	24 ms	32 ms

Therefore, the average waiting time is (0+4+24+32)/4 = 15 ms

b) Re-order the processes for the minimum average waiting time.

For the minimum waiting time, the processes must be ordered as follows:

P_1, P_4, P_3, P_2.

The waiting times for the processes become:

P_1	P_4	P_3	P_2
0	4 ms	10 ms	18 ms

The average waiting time is (0+4+10+18)/4 = 8 ms

4) Explain what the values of a and b will be if we call the function CengDept(defined below) with inputs 78 and 89.

```
def CengDept (a, b):
if (a > 0 and b > 0):
 a = a + b;
  a = a + b;
  a = a + b;
 print(a and b)
```

Answer:

78 and 89
167 = 78 + 89;
167 and 89
256 = 167 + 89;
256 and 89
345 = 256 + 89;
345 and 89

5) a) What is the role of a router in a network?

Answer:

Answer: A router is a networking device that forwards data packets between different networks. It routes traffic from a local network (like a LAN) to the Internet or other networks, determining the best path for the data packets to travel.

b) Describe what an IP address is and its function and significance in networking.

Answer:

An IP address is a unique string of numbers separated by periods (IPv4) or colons (IPv6) that identifies each computer using the Internet Protocol to communicate over a network. An IP address uniquely identifies a device on a network, allowing for the correct routing of data packets to and from that device. It is essential for ensuring that data reaches its correct destination.