



Sir Syed University of Engineering & Technology
Faculty of Basic & Applied Sciences
Department of _____ Computer Science _____

End Semester Examinations (Spring 2020)

Course Title with Code	CS-330: Microprocessor & Assembly Language	Program	BS(CS)
Instructor	Shakir Karim Buskh, Muhammad Shafique	Semester	5 th
Start date & Time	June 30, 2020 at 11:30 AM	Submission Deadline	June 30, 2020 at 05:30 PM
Maximum Marks	50		

IMPORTANT INSTRUCTIONS:

Read the following Instructions carefully:

- Attempt All Questions on MS-Word. Font theme and size must be Times New Roman and 12 points respectively. Use line spacing 1.5. **Convert file to PDF format before submitting.**
- You may provide answers HANDWRITTEN. **The scanned solution must be submitted in PDF format** (Use any suitable Mobile Application for Scanning)
- For Diagrams, you can use paper and share a clear visible snapshot in the same Answer Sheet.
- Arrange questions and their subsequent parts in sequence.
- Make sure that your answers are not plagiarized or copied from any other sources. In case of plagiarism, **ZERO** marks will be awarded.
- Provide relevant, original and conceptual answers, as this exam aims to test your ability to examine, explain, modify or develop concepts discussed during the course.
- Recheck your answer before the submission on **VLE** to correct any content or language related errors.
- You must upload your answers via the **VLE platform ONLY**.

You must follow general guideline for students before online examination and during online examination which had already been shared by email and WhatsApp.

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Question 1(a)**[5 marks]**

Calculate the physical address for the **segment register (SR)** and **offset register (OR)**. Also, find out three different logical addresses for the calculated physical address.

SR = the last four digits of your CNIC number (in hex)

OR = your three digit roll number (in hex).

For example, the last four digits of your CNIC number are 0102, then the value of SR = 0102H and if your roll number is 564, then the value of OR = 0564H.

NOTE: If you do not have your CNIC then you must use CNIC number of your father (or guardian). In either case, you must attach the scanned copy of CNIC used.

Question 1(b)**[5 marks]**

The roll numbers allocated to batch 2018 of Computer Science discipline are from 001 to 266. Consider your (three digit) roll number. Calculate the value of Z using the following formula.

$$Z = \text{your three digits roll number} + 12$$

Consider 'Z' as the size of memory in Kilo-Bytes. Answer the following:

- (i) Calculate the possible number of bits this memory device can address.
- (ii) Convert the value of 'Z' KB in the following number systems, showing the steps involved. Direct answers are not acceptable.
 - (a) Binary; (b) Hexadecimal; (c) Octal; (d) Decimal

Question 2**[10 marks]**

In the Intel x86, the maximum register size is 16 bits. Use the Intel x86 Assembly Language and write a program to count a value "Y" times using only a 16 bits register. Write the code and explain the procedure in your own words. Calculate the value of Y using following formula:

$$Y = (2018 + \text{your three digits roll number}) \times (266)$$

Show all the necessary steps of the algorithm / technique whichever you have used to write the program.

NOTE: The value of 'Y' is in decimal number system.



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Question 3**[15 marks]**

Using the POP instructions in the code given in Table 1, perform the following:

- (i) Interchange the values of AX and DX
- (ii) Interchange the values of BX and SI
- (iii) Interchange the values of DI and CX

Show the contents of the stack after each PUSH and POP instruction. Also, write the logical addresses for each instruction.

Table 1

Logical Address	Assembly Code
	CALL MY_PROC
	INC BX
	MY_PROC PROC
	PUSH AX
	PUSH BX
	PUSH DX
	PUSH CX
	PUSH DI
	PUSH SI
	POP _____
	POP _____
	POP _____
	POP _____
	POP _____
	POP _____
	MY_PROC ENDP

Use the formulae given below to calculate the values of variables used in this question. All the values are in hexadecimal number systems.

Let the 13 digits of your CNIC number be “ $d_1d_2d_3d_4d_5 - d_6d_7d_8d_9d_{10}d_{11}d_{12} - d_{13}$ ”

$$\text{AX} = (d_{10} d_{11} d_{12} d_{13} + \text{your three digits roll number}) \text{H}$$

$$\text{BX} = (d_{12} d_{11} d_9 d_{10} + \text{your three digits roll number}) \text{H}$$

$$\text{CX} = (d_{13} d_{12} d_{11} d_{10} + \text{your three digits roll number}) \text{H}$$

$$\text{DX} = (d_{11} d_{12} d_{10} d_{13} + \text{your three digits roll number}) \text{H}$$

$$\text{DI} = (d_{13} d_{10} d_9 d_{11} + \text{your three digits roll number}) \text{H}$$

$$\text{SI} = (d_9 d_{13} d_{10} d_{12} + \text{your three digits roll number}) \text{H}$$

$$\text{Stack Pointer (SP)} = (1000 + \text{your three digit roll number}) \text{H}$$

$$\text{Code Segment (CS)} = (2000 + \text{your three digit roll number}) \text{H}$$

$$\text{Instruction Pointer (IP)} = (0110 + \text{your three digit roll number}) \text{H}$$

For example, your roll number is 564, then $SP = 1564\text{H}$, $CS = 2564\text{H}$, and $IP = 0674\text{H}$

Assume that the subroutine call starts at the offset ($IP + 0040\text{H}$).



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Question 4**[15 marks]**

Consider an array of five numbers N1, N2, N3, N4, and N5 and write an Intel x86 Assembly Language program to perform the following:

- (i) Find the maximum and minimum numbers among the given numbers
- (ii) Arrange the given numbers in ascending order
- (iii) Arrange the given numbers in descending order

Show all the necessary steps of the algorithm whichever you are using (in hand-written form) to write the program.

Use the following formulae to calculate five numbers.

$$N1 = (a \times 3) + ((c \times d) + 5)$$

$$N2 = N1 + a + d$$

$$N3 = (N2 \times 2) + a + b$$

$$N4 = d + a + 11$$

$$N5 = N1 \times a$$

Where **a, b, c, d** are four digits, which can be calculated by using the following formula.

$$abcd = 2018 + \text{your three digit roll number}$$

For example, if your roll number is 400, then $abcd = 2418$. Thus, $a=2$, $b=4$, $c=1$, and $d=8$.

The output of the program must be displayed in the following manner:

- Cleared output screen
- Given numbers are: _____
- The highest number among the given numbers is: _____
- The lowest number among the given numbers is: _____
- Given numbers arranged in ascending order: (in the form $N1 < N2 < N3 < N4 < N5$)
- Given numbers arranged in descending order: (in the form $N1 > N2 > N3 > N4 > N5$)
- Mention your full name, your complete roll number, and section on right bottom corner of the screen.