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| Serial No: |
| **Sessional II** |
| **Total Time: 1 Hour** |
| **Total Marks: 40** |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Signature of Invigilator |

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| **EE-227 Computer**  **Logic Design** |
| Monday April 27th, 2015 |
| **Course Instructor** |
| Dr. Ayub Alvi, Dr. Fuleah Razzak and  Mr. Jawad Hassan |

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## DO NOT OPEN THE QUESTION BOOK OR START UNTIL INSTRUCTED.

**Instructions:**

1. Attempt on question paper. Attempt all of them. Read the question carefully, understand the question, and then attempt it.
2. No additional sheet will be provided for rough work. Use and mark the back of the last page for rough work.
3. If you need more space write on the back side of the paper and clearly mark question and part number etc.
4. After asked to commence the exam, please verify that you have **7 pages** different printed pages including this title page. There are total of **2 Questions**.
5. **Calculator is NOT allowed**.
6. Use permanent ink pens only. Any part done using soft pencil will not be marked and cannot be claimed for rechecking.
7. **For each question show your complete method in solution**.

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|  | **Q-1** | **Q-2** | **Total** |
| **Total**  **Marks** | **24** | **16** | **40** |
| **Marks Obtained** |  |  |  |

**Vetted By: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Vetter Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Question No.1 [6 + 6 + 12 = 24]**

1. Implement following function with a single **8 to 1** multiplexer. **[6]**

**F (w, x, y, z) = ∑ (1, 4, 5, 9, 10, 11, 13, 14)**

1. Draw and label the circuit diagram of a binary 4-bit Adder-Subtractor circuit for subtraction. Also mention the carry, overflow or/and sum bits. Use the following operands: **[6]**

**A = 0011**

**B = 1101**

1. Design a circuit which has four inputs **A, B, C and D** and two output functions F1 and F2.
   1. Function **F1**will be true (**F1 = 1**) when number of 1’s at the inputs is even. If corresponding decimal value of input binary is greater than 12 then it may be considered as **Don’t Care** (**F1 = X**).
   2. Function **F2**will be true (**F2 = 1**) when numbers of 1’s at the inputs is odd. If corresponding decimal value of input binary is greater than 10 then it may be considered as **Don’t Care** (**F2 = X**) **[12]**

**Question No.2 [ 6 + 10 =16]**

1. **FAST-NU** students Batch-14 have made a new Flip-Flop named **NU** Flip-Flop. When the inputs **N** and **U** of this flip-flop are **00, 01, 10 and 11**, the Flip-Flop complements the present state, No change occurs, sets to 1, and clear to 0, respectively. **[6]**
2. Tabulate its characteristic table
3. Derive its’ characteristic equation
4. Show how you can construct a **NU** flip-flop using D-type flip-flop.
5. Analyze the following circuit with **JK** flips flops and provides state equations, state table and state diagram. **[10]**

