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| Serial No: |
| **Sessional I** |
| **Total Time: 1 Hour** |
| **Total Marks: 45** |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Signature of Invigilator |

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| **EE-227 Digital**  **Logic Design** |
| Monday 15th February, 2016 |
| **Course Instructor** |
| Dr. Ayub Alvi, Dr. Mewish Hassan,  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 **Six (6)** different printed pages including this **Title page** and an **Rough work page** at the end. There are total of **4 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 | Q-3 | Q-4 | **Total** |
| **Total**  **Marks** | **10** | **8** | **15** | **12** | **45** |
| **Marks Obtained** |  |  |  |  |  |

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

**Question No.1 [2 + 2 + 2 + 4 = 10]**

Note: Perform the following conversions and show your method.

1. (1001010.101)2 = ( )10 [2]
2. (727.316)8 = ( )16 [2]
3. (331.8125)10 = ( )2  [2]
4. (001110011000)BCD + (011101011000)BCD = ( )BCD  [4]

Question No.2 [4 + 4 = 8]

1. Convert **(11110101001)2** to its equivalent decimal values by considering it in SM (sign-magnitude) signed notations: [4]
2. Subtract the following numbers using 2’s complement method. Use 8 bits to represent these values. [ 4]

35 from 24

**Question No.3 [8 + 7 = 15]**

1. Find the POS and SOP canonical forms of following Boolean expression. Do not use K-Map or Truth Table: [8]

(X' + Y + Z) (W + X) (Y + Z')

1. Show K-MAP for F(w, x, y, z) = Σ ( 0, 2, 4, 5, 7, 8, 10, 13,14, 15) and specify the following: [7]

Simplified F(SOP Form):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Simplified F(POS Form):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Question No.4 [6 + 6 = 12]**

1. Use K-map to give the simplest expression in POS form for the following function. [6]

F(A, B, C, D) = π (0, 1, 2, 8, 9, 10, 13, 15)

1. Implement the following multi-level function using fewest number of NAND gates only. Assume that all variables (A, B, C, D and E) are available in TRUE and COMPLEMENT form. [6]

F = [( B’ C + D’ E)A + C’ D (B + C’ )] B D'

**Rough Work**