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| **Benha University**  **Faculty of Engineering at Shoubra**  **Electrical Engineering Department**  **PHD (Communications)** | Benha Logo | **Final Term Exam**  **Date: Sunday 11/1/2015**  **Subject: Statistical Digital Signal Processing**  **Duration: 3 hours** |
| * **Answer all the following questions** * **Illustrate your answers with sketches when necessary** | | * **No. of questions : 4** * **Total Mark: 210 Marks** |

***Question (1)[80 marks]***

1. **Compare between the probability theory and measure theory. *[15 marks]***
2. **Define: *[20 marks]***
   * **Probability space.**
   * **Abstract space.**
   * **Event space.**
   * **Probability measure.**
3. **Estimate the probability of a uniform spinning pointer: *[10 marks]***
   * **Using probability density function.**
   * **Using indicator function.**
4. **True or False *[15 marks]***
   * **Probability may be positive or negative.**
   * **The probability of a sample space is less than one.**
   * **The probability of the union of distinct of mutually exclusive regions is the sum of the probability of the individual events.**
5. **Find the probability of a single coin flip using: *[10 marks]***
   * **Probability mass function.**
   * **Indicator function.**
6. **Let Ω = {0, 1}. Let F = {{0}, {1}, Ω = {0, 1}, ∅}.Define the set function P(F); if P(F) = p for F = {0}. *[10 marks]***

***Question (2) [35 marks]***

**Show how you can use the statistical digital signal processing in your field of research.**

***Question (3) [45 marks]***

1. **Explain the meaning of "Random Variable". *[10 marks]***
2. **Explain the spinning wheel experiment as a random variable. *[10 marks]***
3. **Define: *[15 marks]***
   * **Random Vector.**
   * **Random Process.**
4. **Give an example for a random variable as a composite function. *[10 marks]***

***Question (4) [50 marks]***

1. **Define the average using the following equation. Then give an example. *[15 marks]***
2. **Describe the meaning of the law of large number. *[10 marks]***
3. **Explain the Expectations. *[10 marks]***
4. **Find the expectation EX of a Random Variable x if: *[15 marks]***
   * **Its density is one at [0,1].**
   * **X is an exponential random variable with a parameter**

***Good luck***

***Dr .Michael Nasief***