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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**
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***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]***

$$Sn\left(ω\right)= \sum\_{aϵA}^{}a r\_{a}^{\left(n\right)}(ω)$$

1. **Describe the meaning of the law of large number. *[10 marks]***
2. **Explain the Expectations. *[10 marks]***
3. **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** $μ.$

***Good luck***

***Dr .Michael Nasief***