Faculty of Engineering

Student Name:

Monday 4/1/2016

Philadelphia University

Student ID number:

Second Exam

Mechanical Eng. Dep.

Engineering Measurements (620344)

Eng. Laith Batarseh

allowed time: 50 min

Problem #1: chose the correct answer for the following questions and fill the given table (12mark)										
				(Que	stio	n			
	Answer	1	2	3	4	5	6	7	8	
	a									
	b									
	c									
	d									
	e									
1. The galvanometer is a DC measuring device work in which of the following principles										
a. resistive b. c	apacitive c	c. ele	ectro1	magı	netic	d.	pho	tovo	ltaic	e. none of the previous
 2. Iron vane is a device used to measure a. Alternating current b. AC voltage c. direct current d. DC voltage e. none of the previous 										
3. Input circuit is a piece of measurement system found commonly between a. signal conditioner b. transmission c. Display and transmission and processing processing signal conditioner signal conditioner										

b.20N d.40N a. 50 N c.30N e. none of the previous

10 Ampere current passes through 1m length conductor. If 40% of this conductor is located in 5 Webber/m² magnetic flux. Find the generated force between the conductor and the magnetic

5. Piezoelectric transducer has the following values: voltage sensitivity = 0.01 V.m/N, thickness = 10mm is used to measure static pressure. If the generated voltage was 10 Volt, what would be the value of pressure

a. 100 kPa

flux

b.50 kPa

c.25 kPa

d. 10 kPa

e. none of the previous

6. An experiment produces 8 points of data. What is the maximum order of curve fitting curve can be obtained

a. 4

b.5

c.6

d. 7

e. none of the previous

7. When we have the case of imprecise points, the curve fitting is called

a. interpolation

b. regression

c. random

d. sinusoidal

e. none of the previous

8. Which of the following measuring devices has one movable and one fixed plate

a. DC ammeter

b. AC ammeter

c. DC voltmeter

d. AC voltmeter

e. none of the previous

Problem #2: for the given data

(8marks)

1. Find the standard deviation for Y values

2. Find linear fitting curve equation for Y values

Xi	Yi
1	15
2	20
3	25
4	30
5	35

Solution:- n=5

1.
$$Y_m = \frac{15 + 20 + 25 + 30 + 35}{5} = 25$$

$$\sigma = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (Y_i - Y_m)^2} = \sqrt{\frac{1}{5} 250} = 7.07$$

Or
$$\sigma = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (x_i - x_m)^2} = \sqrt{\frac{1}{5-1} 250} = 7.9$$

2. Y=ax+b

$$a = \frac{n\sum x_i y_i - (\sum x_i)(\sum y_i)}{n\sum x_i^2 - (\sum x_i)^2} = \frac{(5)(425) - (15)(125)}{(5)(55) - (15)^2} = 5$$

$$b = \frac{\left(\sum y_i\right)\left(\sum x_i^2\right) - \left(\sum x_i y_i\right)\left(\sum x_i\right)}{n\left(\sum x_i^2\right) - \left(\sum x_i\right)^2} = \frac{(125)(55) - (425)(15)}{(5)(55) - (15)^2} = 10$$

$$Y = 5X + 10$$

	Xi	X^2i	Yi	$(\mathbf{Y}_{i} - \mathbf{Y}_{m})^{2}$	Xi*Yi
	1	1	15	100	15
	2	4	20	25	40
	3	9	25	0	75
	4	16	30	25	120
	5	25	35	100	175
Σ	15	55	125	250	425

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Problem #1: chose	the correc	t answer for	the	follo	wing	g que	estio	ns ar	ıd fil	l the	given table (12mark)
				Question				n			
		Answer	1	2	3	4	5	6	7	8	
		a									
		b									
		С									
		d									
		e									
9. When we have the case of imprecise points, the curve fitting is called a. interpolation b. regression c. random d. sinusoidal e. none of the previous											
a. DC voltage b.				urrei	nt	d.	<mark>Alte</mark>	<mark>rnati</mark>	<mark>ng c</mark>	<mark>urre</mark> ı	nt e. none of the previous
11. 10 Ampere cur Webber/m ² m flux a. 50 N	rrent pass agnetic flu b.20N	ix. Find the	1m le e gen e.301	nera	h co ited	ndu forc	e be	. If 6 twee	en tl	of tl	his conductor is located in 5 onductor and the magnetic e. none of the previous
12. Input circuit is a. transducer and signal conditioner	b. tra	nsmission		Ďisp	lay		d.	sign	al c		tioner e. none of the
13. Piezoelectric transducer has the following values: voltage sensitivity = 0.02 V.m/N, thickness = 10mm is used to measure static pressure. If the generated voltage was 10 Volt, what would be the value of pressure a. 100 kPa b.50 kPa c.25 kPa d. 10 kPa e. none of the previous											
14. The galvanometer is a DC measuring device work in which of the following principles a. resistive b. capacitive c. electromagnetic d. photovoltaic e. none of the previous											
15. Which of the f a. DC ammeter	ollowing n b. AC am	_	evico c. AC							ne fi <mark>mete</mark>	
16. An experiment be obtained	16. An experiment produces 5 points of data. What is the maximum order of curve fitting curve can										
a. 4	b.5		c.6				d.	7			e. none of the previous

Problem #2: for the given data

(8marks)

- 3. Find the standard deviation for Y values
- 4. Find linear fitting curve equation for Y values

Solution:- n=5

1.
$$Y_m = \frac{5+8+11+14+17}{5} = 11$$

$$\sigma = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (Y_i - Y_m)^2} = \sqrt{\frac{1}{5}90} = 4.2$$

Or
$$\sigma = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (x_i - x_m)^2} = \sqrt{\frac{1}{5-1} 90} = 4.74$$

2. Y=ax+b

$$a = \frac{n\sum x_i y_i - (\sum x_i)(\sum y_i)}{n\sum x_i^2 - (\sum x_i)^2} = \frac{(5)(195) - (15)(55)}{(5)(55) - (15)^2} = 3$$

$$b = \frac{\left(\sum y_i\right)\left(\sum x_i^2\right) - \left(\sum x_i y_i\right)\left(\sum x_i\right)}{n\left(\sum x_i^2\right) - \left(\sum x_i\right)^2} = \frac{(55)(55) - (195)(15)}{(5)(55) - (15)^2} = 2$$

$$Y = 3X + 2$$

	Xi	X^2i	Yi	$(\mathbf{Y_i} - \mathbf{Y_m})^2$	Xi*Yi
	1	1	5	36	5
	2	4	8	9	16
	3	9	11	0	33
	4	16	14	9	56
	5	25	17	36	85
Σ	15	55	55	90	195

Xi	Yi
1	5
2	8
3	11
4	14
5	17

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a. DC ammeter

a. interpolation

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Problem #1: chose the correct answer for the following questions and fill the given table **(12mark)**

		Question						
Answer	1	2	3	4	5	6	7	8
a								
b								
c								
d								
e								

	е			_		
17. Input circuit is a piece of a. signal conditioner b. trand transmission and product of the condition of	ransmission c.			and e. none of the previous		
18. The galvanometer is a I a. resistive b. capac			which of the fo d. photovoltai			
19. Iron vane is a device use a. Alternating current b.		direct current	d. DC volta	ge e. none of the previous		
				this conductor is located in 5 conductor and the magnetic		
a. 50 N b.20N	c.301	N	d.40N	e. none of the previous		
21. Piezoelectric transducer has the following values: voltage sensitivity = 0.10 V.m/N, thickness = 10mm is used to measure static pressure. If the generated voltage was 10 Volt, what would be the value of pressure						
a. 100 kPa b.50 kPa	c.25	kPa	d. 10 kPa	e. none of the previous		
22. An experiment produces 5 points of data. What is the maximum order of curve fitting curve can be obtained						
a. 4 b.5	c.6		d. 7	e. none of the previous		

23. Which of the following measuring devices has one movable and one fixed plate

c. random

24. When we have the case of imprecise points, the curve fitting is called

b. AC ammeter

b. regression

c. DC voltmeter

d. AC voltmeter

d. sinusoidal

e. none of the previous

e. none of the previous

Problem #2: for the given data

(8marks)

5. Find the standard deviation for Y values

6. Find linear fitting curve equation for Y values

Solution:- n=5

1.
$$Y_m = \frac{14 + 20 + 26 + 32 + 38}{5} = 26$$

$$\sigma = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (Y_i - Y_m)^2} = \sqrt{\frac{1}{5} 360} = 8.5$$

Or
$$\sigma = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (x_i - x_m)^2} = \sqrt{\frac{1}{5-1} 360} = 9.5$$

2. Y=ax+b

$$a = \frac{n\sum x_i y_i - (\sum x_i)(\sum y_i)}{n\sum x_i^2 - (\sum x_i)^2} = \frac{(5)(450) - (15)(130)}{(5)(55) - (15)^2} = 3$$

$$b = \frac{\left(\sum y_i\right)\left(\sum x_i^2\right) - \left(\sum x_i y_i\right)\left(\sum x_i\right)}{n\left(\sum x_i^2\right) - \left(\sum x_i\right)^2} = \frac{(130)(55) - (450)(15)}{(5)(55) - (15)^2} = 8$$

$$Y = 6X + 8$$

	Xi	X^2i	Yi	$(\mathbf{Y}_{\mathbf{i}} - \mathbf{Y}_{\mathbf{m}})^2$	Xi*Yi
	1	1	14	144	14
	2	4	20	36	40
	3	9	26	0	78
	4	16	32	36	128
	5	25	38	144	190
Σ	15	55	130	360	450

Xi	Yi
1	14
2	20
3	26
4	32
5	38