Exam I (98)

1. All matter emits thermal radiation. The higher the temperature of the surface of the object, the more thermal energy is emitted by the object. Simply stated the amount of radiation energy emitted by a surface is given by the equation:

$$q = \varepsilon\sigma A T_s^4$$

where q represents the rate of thermal energy, per unit time, emitted by the surface; ε is the emissivity of the surface, $0 < \varepsilon < 1$, and σ is the Stefan-Boltzman constant ($\sigma = 5.67 \times 10^{-8}$ W/m^2·K^4); A represents the area of the surface in m^2, and T_s is the surface temperature of the object expressed in Kelvin.

I19 ▾ fx

	A	B	C	D
1	ε =	0.0045		
2	σ =	5.67E-08	W/m^2·K^4	
3	A =	25	m^2	
4				
5	T_s (K)		q	
6	365		113.2158	
7	370		119.548	
8	375		126.1423	
9	380		133.0056	
10	385		140.1453	
11	390		147.5686	
12				

a) Using the information in the figure above write the excel formula for cell C6 keeping in mind that the formula written in this cell was copied into cells C7 to C11:

=B1 xB2 x B3 x A6^4

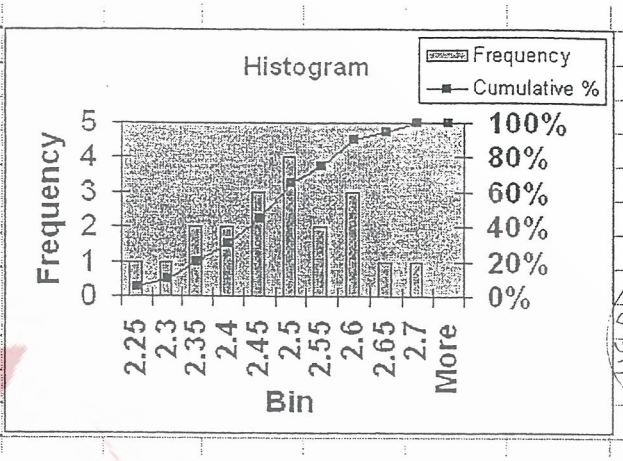
b) What type of equation is $q = \varepsilon\sigma A T_s^4$? of form $y = ax^k$ where $a = \varepsilon\sigma A$

Answer: polynomial (power function) $\log y = \log a + k \log x$

c) What type of excel graph should this function be plotted on so that it plots as a straight line? ~~X-Y scatter with normal axes~~ log-log graph

2. The figure below illustrates the frequency, cumulative distribution and histogram that represent the length in centimeters of 20 screws picked at random from a batch of screws in a factory. Use the information in the figure below to answer the following questions:

Bin	Frequency	Cumulative %
2.25	1	5.0%
2.3	1	10.0%
2.35	2	20.0%
2.4	2	30.0%
2.45	3	45.0%
2.5	4	65.0%
2.55	2	75.0%
2.6	3	90.0%
2.65	1	95.0%
2.7	1	100.0%
More	0	100.0%



a) How many screws are less than or equal to 2.4 cm? 30% of 20 = 6 screws

b) How many screws are between 2.46 cm and 2.6 cm?

(90% - 45%) of 20 = 9 screws

c) What is the likelihood that if a screw is picked at random from the batch its length will be less that 2.35 cm? 20% probability

d) What excel functions are used to find the mean, median, mode, variance, standard deviation, minimum and maximum? Mean: AVERAGE median: MEDIAN mode: MODE variance: VAR standard deviation: STDEV minimum: MIN maximum: MAX

3. Figure 1 below is a complete list of students and information about each student including the city they are from, their age, gender, and GPA. For this problem study each figure and answer the question corresponding to each figure.

Figure 1:

	A	B	C	D	E
1	Student	City	Age	Gender	GPA
2	Alia	Beirut	17	Female	3.8
3	Ayman	Sour	18	Male	2.33
4	Ghassan	Beirut	20	Male	3
5	Hani	Tripoli	18	Male	2.78
6	Jad	Beirut	18	Male	3.4
7	Lama	Sour	19	Female	2.2
8	Malek	Saida	18	Male	2.7
9	Marwa	Jounieh	18	Female	3.75
10	Nadine	Tripoli	18	Female	2.8
11	Omar	Beirut	20	Male	3.9
12	Rawan	Jounieh	19	Female	3.2
13	Said	Zahle	19	Male	3.33
14	Tarek	Sour	19	Male	3.8
15	Wissam	Saida	18	Male	2.5
16	Yara	Saida	18	Female	1.7

a) Looking at Figure 1 what column (or field) was used to sort the student records? Are they sorted in ascending or descending order?

Column A is used to sort the student records. They are sorted in ascending alphabetical order [A→Z]

Figure 2:

	A	B	C	D	E
1	Student	City	Age	Gender	GPA
2	Alia	Beirut	17	Female	3.8
4	Ghassan	Beirut	20	Male	3
6	Jad	Beirut	18	Male	3.4
11	Omar	Beirut	20	Male	3.9

b) Looking at Figure 2 what column (or field) was used to filter the data? What was the filter criteria that was used?

Column B was used to filter the data. The criteria was "Beirut"

Figure 3:

	A	B	C	D	E
1	Student	City	Age	Gender	GPA
2	Alia	Beirut	17	Female	3.8
4	Ghassan	Beirut	20	Male	3
6	Jad	Beirut	18	Male	3.4
9	Marwa	Jounieh	18	Female	3.75
11	Omar	Beirut	20	Male	3.9
12	Rawan	Jounieh	19	Female	3.2
13	Said	Zahle	19	Male	3.33
14	Tarek	Sour	19	Male	3.8
17					

c) Looking at Figure 3 what column (or field) was used to filter the data? What was the filter criteria that was used?

Column E was used to filter the data. Filter criteria: greater than or equal to (in custom)

Figure 4:

	A	B	C	D	E
1	Student	City	Age	Gender	GPA
9	Marwa	Jounieh	18	Female	3.75
10	Nadine	Tripoli	18	Female	2.8
16	Yara	Saida	18	Female	1.7

d) Looking at Figure 4 what columns (or fields) were used to filter the data? What was the filter criteria that was used for each?

Columns C & D were used to filter the data.

For Column C: Equals to "18"

Column D: "Female"

4. Using the spreadsheet below name the cells that are involved in a circular reference?

	A	B	C
1	2	22	11
2	16	1	31
3			
4	=A1*C2+B2-B5	=A1*A2/B1 +C1	
5	=A4/C2 -A2	=A5*A1 + C2*A2	
6	=A5	=A6*B4+B1	
7			

Answer: A4, A5, B5, A6, B6

, 2

5. Write the formula in excel that would convert:

a) A density of 0.281 g/cm^3 to slugs/ft^3, the abbreviations used in excel are (Gram = g , Slugs = sg, Centimeter = cm, Feet = ft):

=CONVERT(0.281,"g","sg")/CONVERT(1,"cm^3","ft")^3

b) A heat capacity of 0.285 BTU/(lb$_m$)(F°) to J/(kg)(K°), the abbreviations used in excel are (BTU = BTU, Pound Mass = lbm, Degree Fahrenheit = F, Joule = J, kilogram = kg, Degree Kelvin = K)

=CONVERT(0.285,"BTU","J")/CONVERT(1,"lbm","kg")/CONVERT(1,"F","K"

6.Binary Arithmetic:

a) Add, Subtract and multiply the following binary numbers using binary arithmetic:

35 and 25

100011 and 11001

Addition:

```
  100011
+ 11001
--------
 111100
```

Subtraction

```
  100011
- 11001
--------
  01010
```

Multiplication

```
  100011
x 11001
--------
  100011
 10001100
100010000
--------
1101101011
```

```
  100011
10001100
--------
1001101011
```

```
  1001101011
+ 1000110000
------------
  1101101011
```

b) Divide in binary:

35 R 6

110000111 ÷ 1011

```
        100011
1011 | 110000111
       1011
       -------
        00100011
           1011
           ----
         010001
            1011
            ----
           00110
```