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1. Circle the correct answer choice.

[25 marks]

(a) The level of measurement that allows for the rank ordering of data items is

(i) nominal measurement

(ii) ratio measurement

(iii) interval measurement

(iv) ordinal measurement

(b) The labeling of parts as "defective" or "non-defective" is an example of

(i) ordinal data

(ii) ratio data

(iii) interval data

(iv) nominal data

(c) The speed of an automobile is an example of a variable that uses the

(i) ratio scale

(ii) interval scale

(iii) nominal scale

(iv) ordinal scale

(d) Qualitative data ...

(f) $\mu$ is an example of a

(i) population parameter

(ii) sample statistic

(iii) population variance

(iv) mode

(g) The median of a sample will always be equal to the

(i) mode

(ii) mean

(iii) 50th percentile

(iv) all of the above answers are correct

(h) The $p^{th}$ percentile is a value such that at least $p$ percent of the observations are

(i) less than or equal to this value

(ii) less than this value

(iii) more than or equal to this value

(iv) more than this value

(i) Which of the following is a measure of dispersion?

(i) percentiles

(ii) quartiles

(iii) interquartile range

(iv) all of the above are measures of dispersion

(j) The standard deviation of a sample of 100 observations equals 64. The variance of the sample equals

(i) 8

(ii) 10

(iii) 6400

(iv) 4,096

(k) When s is used to estimate σ, the margin of error is computed by using

(i) normal distribution

(ii) t distribution

(iii) the mean of the sample

(iv) the mean of the population

(l) In order to determine an interval for the mean of a population with unknown standard deviation a sample of 61 items is selected. The mean of the sample is determined to be 23. The number of degrees of freedom for reading the t value is

(i) 22

(ii) 23

(iii) 60

(iv) 61

(m) The level of significance is the

(i) maximum allowable probability of Type II error

(ii) maximum allowable probability of Type I error

(iii) same as the confidence coefficient

(iv) same as the p-value

(n) When the *p*-value is used for hypothesis testing, the null hypothesis is rejected if

(i) p-value $\leq \alpha$

(ii) $\alpha <$ p-value

(iii) p-value $\geq \alpha$

(iv) p-value $= \alpha$

(o) A student believes that the average grade on the final examination in statistics is at least 85. She plans on taking a sample to test her belief. The correct set of hypotheses is

(i) H0: $\mu < 85$ Ha: $\mu \geq 85$

(ii) H0: $\mu \leq 85$ Ha: $\mu > 85$

(iii) H0: $\mu \geq 85$ Ha: $\mu < 85$

(iv) H0: $\mu > 85$ Ha: $\mu \leq 85$

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2. The following data shows the annual salaries of football coaches at some state supported universities.

| University | Salary (in $1,000) |
|---|---|
| A | 53 |
| B | 44 |
| C | 68 |
| D | 47 |
| E | 62 |
| F | 59 |
| G | 53 |
| H | 94 |

(a)

(i) Compute the mean annual salary. [3 marks]

$\sum_{i=1}^{n} x_i$ / $n$

$\frac{53+44+68+47+62+59+53+94}{8} = 60$

(ii) Compute the standard deviation. [5 marks]

$\sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n-1}}$

$\frac{(53-60)^2+(44-60)^2+(68-60)^2+(47-60)^2+(62-60)^2+(59-60)^2+(53-60)^2+(94-60)^2}{7}$

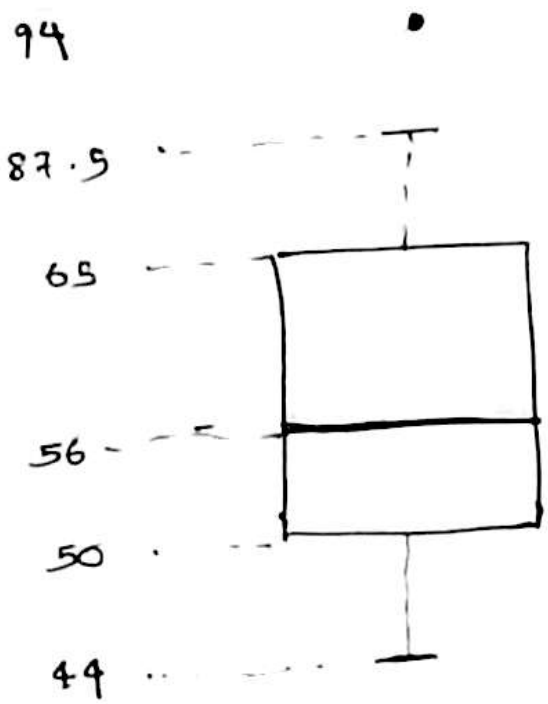
$= \frac{(-7)^2+(-16)^2+(8)^2+(-13)^2+(2)^2+1^2+(-7)^2+(34)^2}{7}$

$= 15.802$ //

(iii) Compute the median annual salary. [3 marks]

44, 47, 53, 53, 59, 62, 68, 94

56 //




Q. 15 × 1.5
. 22.5

$H_0: \mu_1 - \mu_2 = 0$ $\mu_1$ - mean usage of tv

$\mu_2$ - mean usage of radio

$H_a: \mu_1 - \mu_2 \neq 0$

(ii) The following R-code and output is given for the analysis.

```
> tv
 [1] 22  8 25 22 12 26 22 19 21 23 14 14 14 16 24
> radio
 [1] 25 10 29 19 13 28 23 21 21 23 15 18 17 15 23
> t.test(tv,radio,paired=T)

        Paired t-test

data:  tv and radio
t = -2.3577, df = 14, p-value = 0.03347
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -2.2916261 -0.1083739
sample estimates:
mean of the differences
                  -1.2
```

What is the correct test statistic and p-value associated with the hypothesis test? [4 marks]

Sales

(ii) Determine the estimated regression line. [3 marks]

Sales = 80 + 4 years

(iii) Interpret the slope coefficient. [2 marks]

4.00

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(iv) Test if the relationship between sales and years of experience is statistically significant at 0 .05 level of significance. [3 marks]

T test

F test $H_0: \beta_1 = 0$

$H_a: \beta_1 \neq 0$

P value $6.61 \times 10^{-6} \approx 0$

$pval < 0$

$pval < \alpha$

∴ We can reject null hypothesis

So slope is not equal to 0.

(v) Interpret the coefficient of determination and comment on the

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4. Circle the correct answer. **This question and the given coding/output relates to Matlab/GNU Octave.** [25 marks]

(a) Which of the following matrix is created by the following code?

```
>> a = [1 2];
>> b = [3 4];
>> c = [5 ; 6];
>> d = [a ; b];
>> e = [d c];
>> f = [[e e] ; [a b a]]
```

(i)
```
>> f =
     1     3     1
     2     4     2
     5     6     3
     1     3     4
     2     4     1
     5     6     2
```

(ii)
```
>> f =
     1     2     1
     3     4     2
     5     6     3
     1     2     4
     3     4     1
     5     6     2
```

(iii)
```
>> f =
     1     2     5     1     2     5
     3     4     6     3     4     6
     1     2     3     4     1     2
```

(iv)
```
>> f =
     1     3     5     1     3     5
     2     4     6     2     4     6
     1     2     3     4     1     2
```

(b) Which of the following line of code creates the matrix $\begin{bmatrix} 7 & 10 \\ 15 & 22 \end{bmatrix}$ ?

(i) `>> [[1 2] ; [3 4]].^2`

(ii) `>> [[1 2] ; [3 4]]^2`

(iii) `>> [[1 ; 2] [3 ; 4]].^2`

(iv) `>> [[1 ; 2] [3 ; 4]]^2`

(c) Which of the following line of code creates the vector [10 8 6 4 2]?

(i) `>> 10:-2:2`

(ii) `>> linspace(10, 2, 5)`

(iii) `>> 10:-2:1`

(iv) all of the above

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(d) What is the output of the following piece of code?

```
>> a = 1:15;
>> a = reshape(a, 3, 5);
>> a(2:3,3) = [99 ; 99]
```

(i)
```
>> a =
    1    2    3
    4    5   99
    7    8   99
   10   11   12
   13   14   15
```

(ii)
```
>> a =
    1    2    3
    4    5    6
    7   99   99
   10   11   12
   13   14   15
```

(iii)
```
>> a =
    1    4    7   10
    2    5   99   11
    3    6   99   12
```

(iv)
```
>> a =
    1    4    7   10
    2   99   99   11
    3    6    9   12
```

(e) The volume of a cone is given by $V = \pi r^2 \frac{h}{3}$. Let's assume the radius $r$ as 3 and height $h$ as a row vector with the values 2,4,7. Which of the following expression is correct for solving the volumes of cones with the above $h$ values?

(i) `>> r = 3; h = [2, 4, 7]; v = πr²h/3`

(ii) `>> r = 3; h = [2, 4, 7]; v = pi*r^2*h/3`

(iii) `>> r =3; v = pi*r^2*h(2, 4, 7)/3`

(iv) `>> r =3; v = pi*r^2*h[2, 4, 7]/3`

(f) Which of the following is printed to standard output when the following expression is executed?

```
>> fprintf('max  temp  is  %.2f  degree',100.2345)
```

(i) `'max  temp  is  %.2f degree',100.2345`

(ii) `max  temp  is  %.2f degree 100.2345`

(iii) `max  temp  is  100.23  degree`

(iv) `max  temp  is  100.2345  degree`

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(g) Examine the following code. What is the value of B at the end of executing the following code?

```
>>   A = 2;
>>   for i=0:2:4
         A = [A, A*1]
     end
>>   B=A
```

(i) `B = 2, 0, 0, 0`

(ii) `B = 2 0 4 0 8 0 16 0`

(iii)
```
B =  2
     2   0
     2   0   0
     2   0   0   0
```

(iv) None of the above

(h) Which command generates a two-dimensional representation of a three-dimensional surface?

(i) contour()

(ii) mesh()

(iii) pie()

(iv) figure()

(i) Which command generates the solution to the system of equations **A.x = B**?

(i) `>> X = A/B`

(ii) `>> X = sum(A.*B)`

(iii) `>> X = B*A-1`

(iv) `>> X = inv(A).B`

(j) What is the output of the following code segment?

```
>> v = [3.7, 2.4, 0.3, 5.2, 4.8];
>> find( v > 3.5)
```

(i) 3.7 5.2 4.8

(ii) 1 0 0 1 1

(iii) T F F T T

(iv) 1 4 5

(k) Which of the following line declares a function named **myFun** with 2 arguments as input and 3 arguments as output?

(i) function x, y, z = myFun (a, b)

(ii) function myFun(nargin=2, nargout=3)

(iii) function [x, y, z] = myFun (a, b)

(iv) function [x, y] = myFun (a, b, c)

(l) Which of the following code gives the minimum value of the matrix defined b `a = [3, 7, 5; 1, 9, 10; 30, -1, 2]`?

(i) `>> b = min(a); m = min(b)`

(ii) `>> m = min(min(a))`

(iii) `>> m = min(a(:))`

(iv) All of the above

(m) Determine the polynomial represented by `P=[1 0 -2]`.

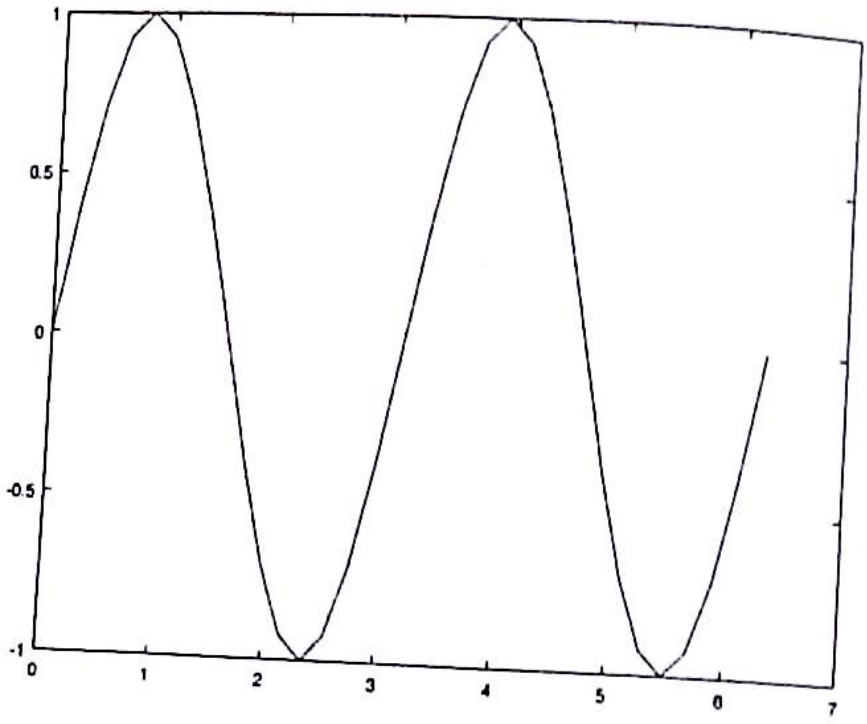
(i) $x^2 - 2$

(ii) $x^2 - 2x$

(iii) $x - 2$

(iv) $x^3 - 2x$

(n) Which of the following code would create the plot given below?




(i)
```
>> x = linspace(0, 2*pi, 2*16+1);
>> plot(x, sin(2*x))
```

(ii)
```
>> x = linspace(0, 2*pi, 2*16+1);
>> plot(x, sin(x))
```

(iii)
```
>> x = linspace(0, pi, 2*16+1);
>> plot(x, sin(2*x))
```

(iv)
```
>> x = linspace(0, pi, 2*16+1);
>> plot(x, sin(x))
```

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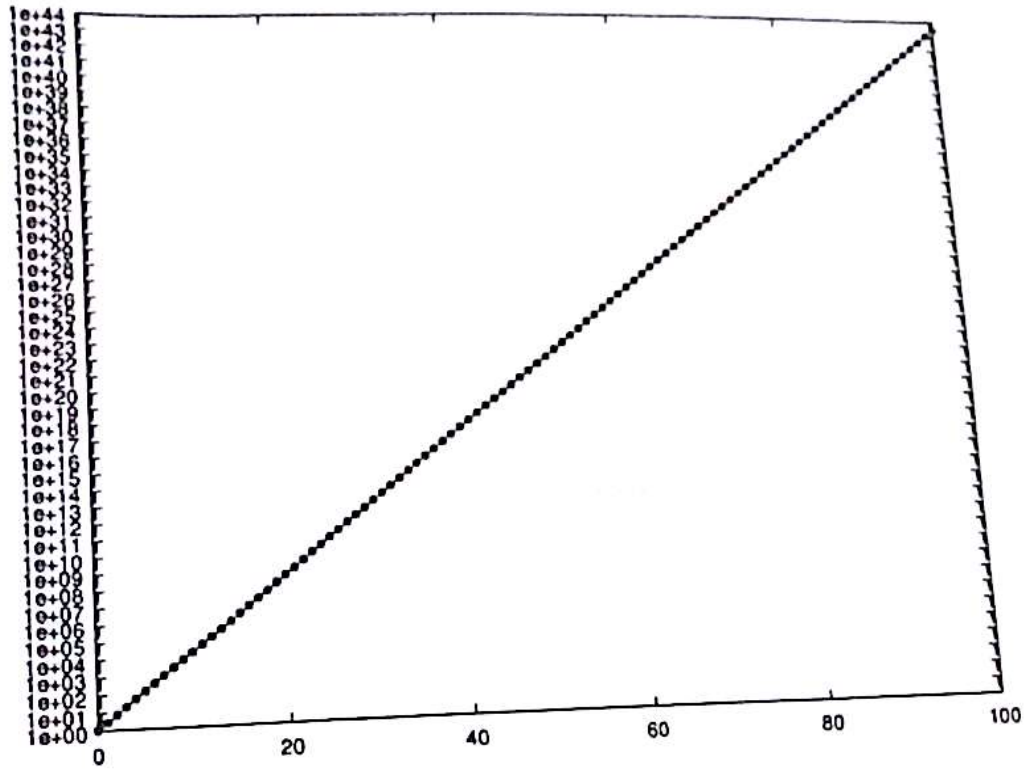
(o) Which of the following code would create the plot given below?




(i) `>> x = 0:100; semilogx(x, exp(x), 'k.-')`

(ii) `>> x = 0:100; semilogy(x, exp(x), 'k.-')`

(iii) `>> x = 0:100; plot(x, exp(x), 'k.-')`

(iv) `>> x = 0:100; semiloglog(x, exp(x), 'k.-')`

**********