**ECON 380: Business Statistics (Spring – 2017/18)**

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***Midterm Exam 3 (30 points)***

Student Name: ……ID #.....

Exhibit 1

In the last presidential election, before the candidates started their major campaigns, the percentages of registered voters who favored the various candidates were as follows.

| | **Percentages** |
|---|---|
| Republicans | 34% |
| Democrats | 43% |
| Independents | 23% |

After the major campaigns began, a random sample of 100 voters showed that 45 favored the Republican candidate; 41 were in favor of the Democratic candidate; and 14 favored the Independent candidate. We are interested in determining whether the proportion of voters who favored the various candidates had changed.

1. Refer to Exhibit 1. The calculated value for the test statistic equals
   a. 7.17
   b. 0.75
   c. 4.61
   d. 5.38

2. Refer to Exhibit 1. The hypothesis is to be tested at the 10% level of significance. The critical value from the table equals
   a. 4.605
   b. 6.251
   c. 5.991
   d. 7.815

3. Refer to Exhibit 1. The *p*-value is
   a. greater than 0.10
   b. between 0.05 and 0.10
   c. between 0.025 and 0.05
   d. between 0.01 and 0.025

4. Refer to Exhibit 1. The null hypothesis is
   a. rejected at $\alpha = 1\%$
   b. rejected at $\alpha = 5\%$
   c. accepted at $\alpha = 5\%$
   d. accepted at $\alpha = 10\%$

Exhibit 2

In a completely randomized experimental design involving five treatments, 13 observations were recorded for each of the five treatments (a total of 65 observations). The following information is provided: SSTR = 200, SST = 800

5. Refer to Exhibit 2. The sum of squares within treatments (SSE) is
a. 1,000
b. 1,600
c. 200
d. 600

6. Refer to Exhibit 2. The number of degrees of freedom for "between treatments" is
a. 4
b. 59
c. 5
d. 60

7. Refer to Exhibit 2. The number of degrees of freedom corresponding to "error" is
a. 4
b. 59
c. 5
d. 60

8. Refer to Exhibit 2. The mean square between treatments (MSTR) is
a. 3.34
b. 50
c. 10
d. 12.00

9. Refer to Exhibit 2. The mean square error (MSE) is
a. 50
b. 600
c. 200
d. 10

10. Refer to Exhibit 2. The test statistic is
a. 0.2
b. 15
c. 3.75
d. 5

11. Refer to Exhibit 2. The *p*-value for the test is
a. less than 0.01
b. between 0.025 to 0.05
c. between 0.01 to 0.025
d. between 0.05 to 0.10

12. Refer to Exhibit 2. The null hypothesis is
a. rejected at $\alpha = 1\%$
b. accepted at $\alpha = 1\%$
c. accepted at $\alpha = 5\%$
d. accepted at $\alpha = 10\%$

13. In a completely randomized design involving three treatments, the following information is provided:

| | **Treatment 1** | **Treatment 2** | **Treatment 3** |
|---|---|---|---|
| Sample Size | 10 | 10 | 5 |
| Sample Mean | 4 | 8 | 9 |

The overall (grand) mean for all the treatments is
a. 7
b. 6.6
c. 7.25
d. 4.89

14. A sample of 31 elements is selected to estimate a 95% confidence interval for the variance of the population. The chi-square values to be used for this interval estimation are
a. 18.493 and 43.773
b. 32.357 and 71.420
c. 34.764 and 67.505
d. 16.791 and 46.979

15. We are interested in testing whether the standard deviation of a population is significantly less than 12. The null hypothesis for this test is
a. $H_o$: $\sigma^2 \geq 144$
b. $H_o$: $s^2 \geq 144$
c. $H_o$: $s^2 \geq 12$
d. $H_o$: $\sigma^2 \geq 12$

16. In testing if the variance of all filled bottles is different from 0.20 or no, a sample of 30 bottles showed a variance of 0.29. The *p*-value for this test is
a. between 0.025 to 0.05
b. between 0.01 to 0.05
c. between 0.10 to 0.20
d. between 0.05 to 0.10

17. A sample of 51 observations yielded a sample standard deviation of 6. If we want to test $H_o$: $\sigma^2 = 40$, the test statistic is
a. 54
b. 9.15
c. 7.5
d. 45

Exhibit 3

Last year, the standard deviation of the ages of the students at UA was 1.8 years. Recently, a sample of 51 students had a standard deviation of 2.1 years. We are interested in testing to see if there has been a significant change in the standard deviation of the ages of the students at UA.

18. Refer to Exhibit 3. The test statistic is
a. 70
b. 58.33
c. 81.67
d. 68.056

19. Refer to Exhibit 3. The *p*-value for this test is
a. between 0.01 and 0.025
b. between 0.025 and 0.05
c. between 0.05 and 0.10
d. between 0.10 and 0.90

20. Refer to Exhibit 3. The null hypothesis is
a. rejected at $\alpha = 1\%$
b. rejected at $\alpha = 5\%$
c. rejected at $\alpha = 10\%$
d. accepted at $\alpha = 10\%$

Exhibit 4

We are interested in determining whether or not the variances of the sales at two cities (A and B) are equal or no. A sample of 26 days of sales at city A has a sample variance of 30 while a sample of 16 days of sales from city B has a sample variance of 20.

21. Refer to Exhibit 4. The test statistic is
a. 1.50
b. 0.67
c. 0.44
d. 2.25

22. Refer to Exhibit 4. The *p*-value for this test is
a. between 0.05 and 0.10
b. between 0.025 and 0.05
c. more than 0.1
d. more than 0.2

23. Refer to Exhibit 4. The null hypothesis is
a. rejected at $\alpha = 1\%$
b. rejected at $\alpha = 5\%$
c. rejected at $\alpha = 10\%$
d. accepted at $\alpha = 10\%$

Exhibit 5

We are testing if 4 means are equal or no, and t. The following is the partial ANOVA Table.

| **Variation** | **SS** | **DF** | **MS** | **F** |
|---|---|---|---|---|
| Treatments | 6750 | ……. | …….. | …….. |
| Error | ……. | ……. | 500 | |
| Total | …….. | 19 | | |

24. Refer to Exhibit 5. The null hypothesis for this ANOVA problem is
a. $\mu_1=\mu_2=\mu_3=\mu_4$
b. $\mu_1=\mu_2=\mu_3=\mu_4=\mu_5$
c. $\mu_1=\mu_2=\mu_3=\mu_4=\mu_5=\mu_6$
d. $\mu_1=\mu_2=$ ….. $=\mu_{20}$

25. Refer to Exhibit 5. The mean square between treatments (MSTR) equals
a. 400
b. 2,250
c. 1,687.5
d. 500

26. Refer to Exhibit 5. The sum squares total (SST) equals
a. 14,750
b. 8,000
c. 2,750
d. 2,250

27. Refer to Exhibit 5. The F-test statistic to test the null hypothesis equals
a. 0.22
b. 0.84
c. 4.5
d. 4.22

28. Refer to Exhibit 5. The *p*-value for this test is
a. less than 0.01
b. between 0.01 and 0.025
c. between 0.025 and 0.05
d. between 0.05 and 0.10

29. Refer to Exhibit 5. The null hypothesis is
a. rejected at $\alpha = 1\%$
b. rejected at $\alpha = 5\%$
c. accepted at $\alpha = 5\%$
d. accepted at $\alpha = 10\%$