College of Sciences
Department of
Statistics and Operations
Research

جامعة الملك سعود
King Saud University

Final Exam

Tuesday, December 24, 2019 **Rabi Al-Thani, 27, 1441**	**STAT 105**	**Academic year** **2019-2020** **1440-1441**
8 : 00 am		**First Semester**

Student's Name	
ID number	
Section No.	
Classroom No.	
Teacher's Name	
Roll Number	

Instructions:	40

- ⋆ Choose the nearest number to your answer.
- ⋆ Time allowed is 3 hours.
- ⋆ Do not use pencils or red pens.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34						

Questions (1-9): In an experiment to study the dependence of hypertension on smoking habits, the following data were taken on 166 individuals:

	Non-smokers	Moderate smokers	Heavy smokers
Hypertension	21 (e_{11})	36 (e_{12})	30 (e_{13})
No Hypertension	30 (e_{21})	30 (e_{22})	19 (e_{23})

Use a 0.05 level of significance, to test the following hypotheses:
H_0: Hypertension is independent from smoking habits
H_1: Hypertension is not independent from smoking habits.

1) The value of e_{11} is:

A	B	C	D
30.25	23.15	26.73	12.03

2) The value of e_{12} is:

A	B	C	D
30.25	24.15	34.59	13.03

3) The value of e_{13} is:

A	B	C	D
31.41	12.03	25.68	21.03

4) The value of e_{21} is:

A	B	C	D
30.25	20.15	24.27	12.03

5) The value of e_{22} is:

A	B	C	D
31.41	23.15	26.73	12.34

6) The value of e_{23} is:

A	B	C	D
30.21	26.35	23.32	33.05

7) The value of the test statistics is:

A	B	C	D
7.02	4.23	0.21	8.07

8) The critical value (tabulated value) is:

A	B	C	D
5.991	7.213	2.135	1.021

9) The decision is:

A	B	C
Reject H_0	Accept H_0	Can't decide

Questions (10-12): Consider the tossing of an honest (fair) die. Suppose that the die is tossed 150 times and each outcome is recorded. Test the hypothesis that the distribution of outcomes is not the discrete uniform distribution, against the null hypothesis, that it is, at level $\alpha = 0.05$. The results as follows:

Face	1	2	3	4	5	6
Observed	14	27	31	17	29	32
Expected						

10) The value of the test statistics is:

A	B	C	D
2.1	5.2	7.3	11.6

11) The critical value (tabulated value) is:

A	B	C	D
11.1	6.2	3.2	7.1

12) The decision is:

A	B	C
Reject H_0	Accept H_0	Can't decide

Questions (13-24): Let X be the quantities of rice eaten by 9 men in three months and Y be their weights. The results of X and Y are summarized in the following table:

X	82	66	78	80	85	85	99	99	68
Y	77	50	71	72	81	94	96	99	67

$\sum x_i = 742, \quad \sum x_i^2 = 62240, \quad \sum y_i = 707, \quad \sum y_i^2 = 57557, \quad \sum x_i y_i = 59648.$

13) The value of S_{xx} is:

A	B	C	D
8123.54	5123.35	6324.58	1066.222

14) The value of S_{yy} is:

A	B	C	D
2018.222	8321.546	9321.54	1325.55

15) The value of S_{xy} is:

A	B	C	D
5648.321	1359.778	9654.321	6324.32

16) The coefficient of correlation is:

A	B	C	D
1.564	2.314	0.927	0.0012

Consider the linear regression model:

$$y_i = \beta_0 + \beta_1 x_i, \quad i = 1, \ldots, 9.$$

Let us denote by b_0 and b_1 the estimates for β_0 and β_1 respectively.

17) The value of b_1 is:

A	B	C	D
1.275	5.215	6.325	0.213

18) The value of b_0 is:

A	B	C	D
-26.58	29.56	30.25	2.135

19) A man ate 85kg of rice in three months, then the estimate of his weight is:

A	B	C	D
81.84	29.56	30.25	62.135

The residuals e_i are:

$$0.99, \quad 7.59, \quad 1.89, \quad 3.44, \quad 0.815, \quad -12.185, \quad 3.665, \quad 0.665, \quad -6.86.$$

We want to determine the 95% confidence interval for β_1:

20) The value of the sum of squared errors (SSE) is equal to:

A	B	C	D
122.3	284.066	150.25	70.123

21) The value of $\hat{\sigma}^2$ is:

A	B	C	D
40.58	30.25	20.315	10.254

22) The lower limit of the confidence interval for the parameter β_1 is equal to:

A	B	C	D
1.668	2.035	0.813	3.254

23) The upper limit of the confidence interval for the parameter β_1 is equal to:

A	B	C	D
3.025	1.736	7.035	8.244

24) The difference between the upper and lower limits of the confidence interval for the parameter β_1 is equal to:

A	B	C	D
4.025	0.923	6.035	2.244

Questions (25-34): The following table gives the yield of wheat per test plot under three different fertilizers, A, B, and C.

Fertilizers	Yield of wheat						Total
A	5	6	7	8	6	4	36
B	7	8	7	8	7	8	45
C	6	7	6	8	7	6	40

Assume that a one-way ANOVA model is appropriate. At a 5% level of significance, test the hypotheses:

H_0 : $\mu_A = \mu_B = \mu_C$

H_1 : at least two means not equal.

ANOVA Table

Source of Variation	DF	SS	MS	F
Between fertilizers (Treatment)	A1	B1	C1	D1
Within fertilizers (Error)	A2	B2	C2	
Corrected Total (Total)	A3	B3		

25) The degree of freedom between fertilizers (A1) equals:

A	B	C	D
1	2	3	4

26) The degree of freedom within fertilizers (A2) equals:

A	B	C	D
11	18	12	15

27) The degree of freedom of the total (A3) equals:

A	B	C	D
17	24	30	20

28) The sum of squared between fertilizers (B1) equals:

A	B	C	D
5.123	9.111	10.255	6.778

29) The sum of squared within fertilizers (B2) equals:

A	B	C	D
8.234	14.833	16.555	10.333

30) The sum of squared totals (B3) equals:

A	B	C	D
32.333	15.275	25.125	21.611

31) The value of mean square between fertilizers (C1) equals:

A	B	C	D
3.389	6.333	11.824	8.511

32) The value of mean square within fertilizers (C2) equals:

A	B	C	D
2.525	5.725	0.989	0

33) The value of the test statistics D1 equals:

A	B	C	D
2.525	7.128	1.125	3.427

34) The decision is:

A	B	C
Can't decide	Accept H_0	Reject H_0