King Fahd University of Petroleum and Minerals
Department of Mathematics

CODE01   CODE01

STAT 214
Final Exam
Term 241
26-December-2024
Net Time Allowed: 120

Name: _____

ID: _____ Sec: _____.

Check that this exam has 20 questions.

Important Instructions:

1. All types of calculators may be used, provided that they cannot store text.

2. Use HB 2.5 pencils only.

3. Use a good eraser. DO NOT use the erasers attached to the pencil.

4. Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet.

5. When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.

6. The Test Code Number is already bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.

7. When bubbling, make sure that the bubbled space is fully covered.

8. When erasing a bubble, make sure that you do not leave any trace of penciling.

1 A local pizza restaurant claims to deliver to the dormitories faster than a local branch of a national chain. To test this claim, delivery times (in minutes) were recorded for 10 orders from each restaurant. The following summary statistics were obtained: **Local Pizza Restaurant:** $\bar{X}_1 = 16.7$, $S_1 = 3.0955$ and **National Chain:** $\bar{X}_2 = 18.88$, $S_2 = 2.8662$. At the 0.05 level of significance, perform a hypothesis test to determine if the mean delivery time for the local pizza restaurant is less than the mean delivery time for the national chain. What is the test statistic?

(a) -1.6341

(b) 1.6341

(c) -2.1800

(d) 1.7797

(e) 8.8987

2 A bank is studying the waiting times of customers during the noon-to-1 P.M. lunch period at two branches:

- **Branch A (Commercial District):** $n_A = 15$, $\quad \bar{X}_A = 4.2866$, $\quad S_A = 1.6379$
- **Branch B (Residential Area):** $n_B = 15$, $\quad \bar{X}_B = 7.1146$, $\quad S_B = 2.0821$

Assume the population variances are unequal. Find the critical value for testing whether there is a difference in the mean waiting times between the two branches at a 5% significance level

(a) 1.701

(b) 2.056

(c) 2.042

(d) 2.131

(e) 2.602

3 Nine experts rated two brands of Colombian coffee (A and B) on a 7-point scale for taste, aroma, richness, and acidity. The ratings are as follows:

Expert	Brand A	Brand B
C.C.	24	26
S.E.	27	27
E.G.	19	22
B.L.	24	27
C.M.	22	25
C.N.	26	27
G.N.	27	26
R.M.	25	27
P.V.	22	23

Find the 95% confidence interval estimate for the mean difference in ratings between the two brands.

(a) $-2.6501 \leq \mu_D \leq -0.4610$

(b) $-2.6501 \leq \mu_D \leq 0.4610$

(c) $-0.4610 \leq \mu_D \leq -2.6501$

(d) $0.4610 \leq \mu_D \leq 2.6501$

(e) $-0.610 \leq \mu_D \leq 2.6501$

4 A professor wants to determine if there is more variability in the final exam scores of non-accounting majors compared to accounting majors. The following results are from random samples:

- **Non-accounting** : $n_1 = 140$, $S_1^2 = 3010.2$
- **Accounting** : $n_2, 102$, $S_2^2 = 506.5$

Assume the population final exam scores are normally distributed. At the 5% significance level, what are the null and alternative hypotheses?

(a) $H_0 : \sigma^2_{\text{Non-accounting}} < \sigma^2_{\text{Accounting}}$ vs $H_1 : \sigma^2_{\text{Non-accounting}} \geq \sigma^2_{\text{Accounting}}$

(b) $H_0 : \sigma^2_{\text{Non-accounting}} \leq \sigma^2_{\text{Accounting}}$ vs $H_1 : \sigma^2_{\text{Non-accounting}} > \sigma^2_{\text{Accounting}}$

(c) $H_0 : \sigma^2_{\text{Accounting}} \leq \sigma^2_{\text{Non-accounting}}$ vs $H_1 : \sigma^2_{\text{Aaccounting}} > \sigma^2_{\text{Non-accounting}}$

(d) $H_0 : \sigma^2_{\text{Non-accounting}} \geq \sigma^2_{\text{Accounting}}$ vs $H_1 : \sigma^2_{\text{Non-accounting}} < \sigma^2_{\text{Accounting}}$

(e) $H_0 : \sigma^2_{\text{Non-accounting}} > \sigma^2_{\text{Accounting}}$ vs $H_1 : \sigma^2_{\text{Non-accounting}} > \sigma^2_{\text{Accounting}}$

5 If a contingency table has two rows and two columns, how many degrees of freedom are there for the test of independence?

   (a) 2
   (b) 3
   (c) 4
   (d) 0
   (e) 1

6 Mr. Saleh, regarded as one of the best instructors in the Department of Mathematics at KFUPM, wants to predict a student's final exam score in statistics (Y) based on the number of hours the student studies (X). A regression model was fitted using data from a previous semester, with the following equation:

$$\hat{Y}_i = 40.0 + 6X_i$$

What is the interpretation of Y, the intercept (b_0)?

   (a) The Y intercept $b_0 = 40.0$ indicates that when the student does not study for the final exam, the predicted final exam score is 40.0.
   (b) It indicates that for each increase of one hour in studying time, the predicted change in the final exam score is $+6$
   (c) The Y-intercept $b_0 = 40$ indicates that the maximum possible final exam score is 40.0
   (d) The Y-intercept $b_0 = 40$ indicates that for every additional hour studied, the final exam score increases by 40.0 points.
   (e) The Y-intercept $b_0 = 40$ indicates that the predicted score is 40.0 when the student studies for exactly one hour.

7 The selection of an appropriate regression model depends on the distribution of X and Y values in the scatter plot. What type of relationships does the figure below illustrate?
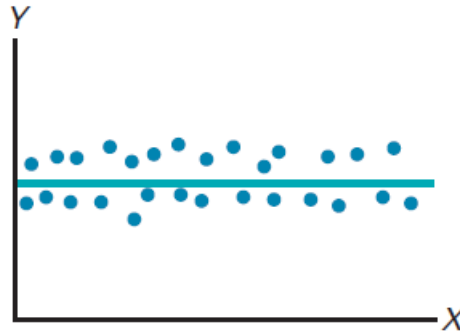
(a) The figure suggests little to no relationship between X and Y, indicating no clear pattern in the data.

(b) The figure illustrates a positive linear relationship between X and Y, where Y increases as X increases.

(c) The figure shows a negative linear relationship, meaning that as X increases, Y generally decreases.

(d) The figure depicts a positive curvilinear relationship between X and Y, where Y increases as X increases, but the rate of increase slows beyond certain values of X.

(e) The figure represents a U-shaped relationship between X and Y, where Y initially decreases and then increases as X increases.

8 A shoe manufacturer is studying the durability of running shoes based on two variables:

- **Forefoot shock-absorbing capability (FOREIMP)**
- **Midsole impact change over time (MIDSOLE)**

The dependent variable, LTIMP, measures shoe durability. The results of a regression analysis are shown below, but some values are missing.

Variable	Coefficient	Std. Error	t Statistic	p-Value
Intercept	-0.02686	A	B	0.7034
FOREIMP	0.79116	C	D	0.0000
MIDSOLE	0.60484	0.07174	E	0.0000

What is D?

(a) $D = 0.0000$

(b) $D = \frac{0.79116}{C}$

(c) $D = \frac{C}{B}$

(d) $D = \sqrt{0.07174}$

(e) $D = 0.79116 + C$

9 The following ANOVA summary table is for a multiple regression model with two independent variables:

Source	Degrees of Freedom	Sum of Squares	Mean Squares	F
Regression	2	60	?	
Error	18	120	?	
Total	?	?		

Compute the coefficient of multiple determination, and the adjusted R^2

(a) 0.2000 and 0.0400

(b) 0.9421 and 0.9324

(c) 0.3333 and 0.2592

(d) 0.8759 and 0.8641

(e) 0.4899 and 0.4456

10 Use the following information from a multiple regression analysis:

$$n = 20, b_1 = 4, b_2 = 3, S_{b_1} = 1.2, S_{b_2} = 0.8$$

Construct a 95% confidence interval estimate of the population slope, β_1

(a) $1.46824 \leq \beta_1 \leq 6.53176$

(b) $0.85225 \leq \beta_1 \leq 9.14775$

(c) $0.65400 \leq \beta_1 \leq 6.53176$

(d) $0.0471 \leq \beta_1 \leq 0.08932$

(e) $-0.0443 \leq \beta_1 \leq -0.0002$

11 The following data represent total revenues (in $millions) for a fast-food store over the 9-year period 2000 to 2008.

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Revenue (in $M)	4.0	5.0	7.0	6.0	8.0	9.0	5.0	5.0	3.5

The last moving average value in a three-year moving average is:

(a) 5.0

(b) 2.7

(c) 1.5

(d) 4.5

(e) 2.5

12 A time series is shown below. Preform single exponential smoothing for this data set using $W = 0.4$. What is the exponentially smoothed value in 2003 (i.e E_{2003})?

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Revenue (in $M)	4.0	5.0	7.0	6.0	8.0	9.0	5.0	5.0	3.5

(a) 6.5984

(b) 7.5590

(c) 5.4400

(d) 5.6640

(e) 4.4400

13 The following are prices and consumption quantities for three products in 2000 and 2020

PRODUCTS		YEAR			
	2000			**2020**	
	Price	Quantity	Price	Quantity
A	$4.00	200	$12.00	1000
B	$6.00	160		900
C	$9.00	80	$21.00	1050

If the simple price index for product B is 250% for the year 2020 (using 2000 as the base year). Then, what is the price of the product in the year 2020?

(a) $15.00
(b) $12.00
(c) $18.00
(d) $6.00
(e) $11.00

14 The Coca-Cola Company's gross revenues (in billions of dollars) from 1995 to 2009 was used to construct an exponential model to forecast the annual revenue for the company. Where:

- Y: is the revenue in billions $
- X: is the code annual value with $X = 0$ in the first year of 1995

The model is given by:

$$\log(\hat{y}_i) = 1.2252 + 0.0168X_i$$

The forecast value of the revenue for the year 2009 is:

(a) $1.4772 billion
(b) $28.8669 billion
(c) $10.0230 billion
(d) $5.9028 billion
(e) $15.0259 billion

15 A survey of 1,000 adult (age $30 - 45$) internet users found that 670 opposed ads on websites. And that a survey of 1,000 young internet users (age 15–29) found that 510 opposed ads on websites. An analyst wants to test whether there is evidence that the proportion of adult Internet users (population 1) is higher than the proportion of young Internet users (population 2) who oppose ads, at the 2.5% level of significance. The pooled proportion of people who oppose the ads is equal to:

(a) 0.59

(b) 0.41

(c) 0.67

(d) 0.51

(e) 0.33

16 The probability of rejecting a false null hypothesis is given by?

(a) $1 - \alpha$

(b) α

(c) β

(d) $\alpha - \beta$

(e) $1 - \beta$

17 A standard six-sided die has six faces. Each face of the die contains either one, two, three, four, five, or six dots. If you roll a die, what is the probability that you will get a face with five dots?

(a) $\frac{1}{6}$

(b) $\frac{2}{6}$

(c) $\frac{3}{6}$

(d) $\frac{5}{6}$

(e) $\frac{1}{2}$

18 If $P(B) = 0.30$, $P(A/B) = 0.60$, $P(B') = 0.70$ and $P(A/B') = 0.50$, find $P(B/A)$

(a) 0.095

(b) 0.736

(c) 0.340

(d) 0.997

(e) 0.667

19 If the Chance of a tagged order form is 0.1, what is the probability that there are fewer than three tagged order forms in the sample of four?

(a) 0.9963
(b) 0.0037
(c) 0.0036
(d) 0.6561
(e) 0.0001

20 You are a financial analyst facing the task of selecting bond mutual funds to purchase for a client's portfolio.You have narrowed the funds to be selected to ten different funds. In order to diversify your client's portfolio, you will recommend the purchase of four different funds. Six of the funds are short-term corporate bond funds. What is the probability that of the four funds selected, three are short-term corporate bond funds?

(a) 0.0298
(b) 0.2988
(c) 0.3178
(d) 0.3810
(e) 0.5452