Department of Statistics & Operations Research
College of Science, King Saud University
STAT 324
Final Examination
Second Semester 1432 – 1433 H

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INSTRUCTIONS:

- Answer all questions.
- Time allowed is 3 Hours
- Do not copy answers from your neighbors; they have different question forms.
- Mobile Telephones are not allowed in the classroom.
- Do not use pencils and red pens when writing your answers
- For each question, put the code of the correct answer in the following table beneath the question number. Please use capital letters: A, B, C, and D.

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	35	36	37	38	39	40

41	42	43	44	45	46	47	48	49	50

Term Marks	Final Exam Marks	Total Marks

Question No. 1

The finished inside diameter of a piston ring is normally distributed with a mean of 12 centimeters and a standard deviation of 0.03 centimeter. Then:

(1) The probability of a ring that will have inside diameter less than 12.05 centimeters is:

(A) 0.0475	(B) 0.9525	(C) 0.7257	(D) 0.8413

(2) The probability that a piston ring will have an inside diameter between 11.95 and 12.05 centimeters is:

(A) 0.725	(B) 0.321	(C) 0.451	(D) 0.905

Question No. 2

A certain machine makes electrical resistors that have an average resistance of 100 (ohms) and a standard deviation of 36 (ohms). If a random sample of size 36 resistors are drawn from the product of this machine, then:

(3) The probability that the average resistance of the 36 resistors will be less than 91(ohms) is:

(A) 0.1549	(B) 0.0753	(C) 0.0668	(D) 0.0875

(4) The probability that the average resistance of the 36 resistors will be between 95 and 105 (ohms) is:

(A) 0.5934	(B) 0.6174	(C) 0.8432	(D) 0.7647

Question No. 3

A random sample of 10 automobile owners shows that in a small village an automobile is driven on average 7.575 km in a half hour with a standard deviation of 1.724. If μ is the average distance automobiles is driven in the village in a half hour and we assume that the population follows a normal distribution, then:

(5) The point estimate for μ is:

(A) 1.724	(B) 7.575	(C) 0.9772	(D) 0.5793

(6) The maximum error of estimation of μ with a 95% confidence is:

(A) 1.233	(B) 12.33	(C) 0.9772	(D) 0.5793

(7) The lower bound of the 95% confidence interval for estimating μ is:

(A) 0.5793	(B) 12.33	(C) 0.9772	(D) 6.342

(8) If the value of α decreases (get smaller), then the length of the confidence interval will:

(A) Decrease	(B) Increase
(C) Increase and then decrease	(D) No change

Question No. 4

A sample of 25 freshman students made a mean score of 77 on a test designed to measure the attitude toward colleges. The sample standard deviation was 10. Assuming the data came from a normal population. Answer the following:

(9) The statistical hypotheses for testing the hypothesis that the mean score is different than 80 is:

(A) $H_0: \mu = 80$ vs $H_1: \mu \neq 80$	(B) $H_0: \mu = 80$ vs $H_1: \mu < 80$
(C) $H_0: \mu = 80$ vs $H_1: \mu > 80$	(D) $H_0: \mu = 77$ vs $H_1: \mu < 77$

(10) The value of the test statistic for this statistical hypothesis is:

(A) -1.500	(B) -2.025	(C) 3.258	(D) 0

(11) At 0.05 level of significance, the Rejection Region (R. R.) of H_0 is:

(A) $(2.064, \infty)$	(B) $(5.821, 6.972)$
(C) $(-\infty, -2.064)$	(D) $(-\infty, -2.064) \cup (2.064, \infty)$

(12) At 0.05 level of significance, the decision is:

(A) Don't Reject H_0	(B) Reject H_0	(C) We can't decide	(D) Reject H_0 and reject H_1

Question No. 5

A random sample of size $n_1 = 31$ is taken from a normal population with standard deviation $\sigma_1 = 5$ has a mean 80. A second random sample of size $n_2 = 36$ is taken from a different normal population with standard deviation $\sigma_2 = 3$ has a mean 75.

(13) The upper bound of the 99% confidence interval for the difference $\mu_1 - \mu_2$ is:

(A) 2.99	(B) 7.65	(C) 2.35	(D) 7.02

(14) The <u>length</u> of the 99% confidence interval for the difference $\mu_1 - \mu_2$ is:

(A) 7.02	(B) 7.65	(C) 2.35	(D) 5.3

Question No. 6

A researcher was interested in making some statistical inferences about the proportion of smokers (P) among the students of a certain university. A random sample of 500 students showed that 150 students smoke.

(15) A good point estimate for P is:

(A) 150	(B) 0.30	(C) 500	(D) 0.50

(16) The lower limit of a 90% confidence interval for P is:

(A) 0.1363	(B) 0.2163	(C) 0.2063	(D) 0.2663

(17) The upper limit of a 90% confidence interval for P is:

(A) 0.3337	(B) 0.3937	(C) 0.2937	(D) 0.3037

(18) If we want to test H_0: $P = 0.25$ against H_1: $P \neq 0.25$ then the test statistic is:

(A) $Z = 2.2398$	(B) $Z = -2.4398$	(C) $Z = 2.582$	(D) $T = 2.2398$

(19) If we want to test H_0: $P = 0.25$ against H_1: $P \neq 0.25$ at $\alpha = 0.1$, then the Acceptance Region (A. R.) of H_0 is:

(A) $[-1.645,\infty)$	(B) $(-\infty,1.645]$	(C) $[-1.645,1.645]$	(D) $[-1.285,\infty)$

(20) If we want to test H_0: $p = 0.25$ against H_1:$p \neq 0.25$ at $\alpha = 0.1$, then the decision is:

(A) Don't reject H_0	(B) Reject H_0	(C) We can't decide	(D) Reject H_0 and reject H_1

Question No. 7

An experiment was performed to compare the abrasive wear of two different materials used in making artificial teeth. 12 pieces of material 1 were tested by exposing each piece to a machine measuring wear. 10 pieces of material 2 were similarly tested. In each case, the depth of wear was observed. The sample of material 1 gave an average wear of 85 units with a sample standard deviation of 4, while the samples of materials 2 gave an average wear of 81 and a sample standard deviation of 5. We are interested to see if the mean abrasive wear of material 1 is greater than that of material 2. Assume that the populations are approximately normally distributed with equal variances.

(21) The null and alternative hypotheses are:

(A)	$H_0: \mu_1 = \mu_2$ vs $H_1: \mu_1 \neq \mu_2$	(C)	$H_0: \mu_1 = \mu_2$ vs $H_1: \mu_1 < \mu_2$
(B)	$H_0: \mu_1 = \mu_2$ vs $H_1: \mu_1 > \mu_2$	(D)	$H_0: \mu_1 < \mu_2$ vs $H_1: \mu_1 = \mu_2$

(22) The value of the test statistic is:

(A) - 2.18	(B) 1.04	(C) 2.35	(D) 2.0863

(23) If we conduct the test at $\alpha = 0.05$ then the Rejection Region (R.R.) of H_0 is:

(A) (-1.725, 1.725)	(B) $(1.96, \infty)$	(C) $(-\infty, -1.725)$	(D) $(1.725, \infty)$

(24) If we conduct the test at α=0.05 then we:

(A) Don't reject H_0	(B) Reject H_o	(C) We can't decide	(D) Reject H_0 and reject H_1

Question No. 8

A quality control engineer is interested in the proportion of defective items in the population of two certain types (Brand A and Brand B) of car tires produced by his manufactory. To help arrive at a decision, an experiment is conducted using a random sample of 300 of Brand A and another independent random sample of 200 of Brand B. The following results were obtained:

	n	Number of defective items
Brand A	300	52
Brand B	200	48

He is interested to see if there is a difference between the proportion of the defective items of Brand A and proportion of the defective items of Brand B.

(25) The null and alternative hypotheses are:

(A)	$H_0: P_A = P_B$ vs $H_1: P_A < P_B$	(C)	$H_0: P_A > P_B$ vs $H_1: P_A < P_B$
(B)	$H_0: P_A = P_B$ vs $H_1: P_A \neq P_B$	(D)	$H_0: P_A = P_B$ vs $H_1: P_A > P_B$

(26) The value of the test statistic is:

(A) - 1.8257	(B) 2.2572	(C) - 3.1421	(D) 1.5426

(27) If we conduct the test at $\alpha = 0.05$ then the Rejection Region (R.R.) of H_0 is:

(A) $(2.046, \infty)$	(B) $(5.821, 6.972)$
(C) $(-\infty, -2.046)$	(D) $(-\infty, -1.96) \cup (1.96, \infty)$

(28) If we conduct the test at $\alpha = 0.05$ then the decision is:

(A) Don't reject H_0	(B) Reject H_0	(C) We can't decide	(D) Reject H_0 and reject H_1

Question No. 9

(29) A bag contains 7 white, 5 black and 4 red balls. If two balls are drawn at random without replacement, the probability that both balls are white is:

(A) 0.312	(B) 0.175	(C) 0.243	(D) 0.235

(30) Let A and B be two events defined on the same sample space with P(A) = 0.4, P(B) = 0.5 and P(AUB) = 0.6. The probability of B for a given A $[P(B|A)]$ is:

(A) 0.67	(B) 0.41	(C) 0.50	(D) 0.75

(31) The proportion of people who respond to a certain mail-order is a continuous random variable X that has the density function

$$f(x) = \begin{cases} k\,(x+2), & 0 < x < 1 \\ 0, & otherwise \end{cases}$$

Then, the value of k is:

(A) 0.5	(B) 0.2	(C) 0.4	(D) 2.5

(32) Consider the random variable X with the following probability distribution function:

X	−1	0	1	2
P(X = x) = f(x)	0.2	0.3	0.2	0.3

Then, the P ($-1 \leq X < 2$) is:

(A) 0.3	(B) 0.4	(C) 0.5	(D) 0.7

(33) Suppose that a random sample is taken from a normal population with standard deviation $\sigma = 3$. If we want to be 95% confident that the sample mean will be within one unit (e =1) of the true mean μ, the sample size (n) of the population needed is:

(A) 6	(B) 35	(C) 138	(D) 85

Question No. 10

Let A, B, and C be three events such that $P(A) = 0.2$, $P(B) = 0.4$, $P(A \cap B \cap C) = 0.05$, and $P(A \cap B)^c = 0.92$, then

(34) $P(C \mid A \cap B)$ is:

(A) 0.604	(B) 0.625	(C) 0. 054	(D) – 0.925

(35) The event A and B are,

(A) Independent	(B) Dependent	(C) Disjoint	(D) None of these

Question No. 11

In a certain college, the geographical distribution of male students is as follows: 50% come from the East (A), 30% come from Midwest (B) and 20% come from Far west (C). The proportions of the male students who wear ties are: 80% for the Easterners, 60% for Midwesterners, and 40% for the Farwestners. If a student is selected randomly, then:

(36) The probability of the selected student wears a tie is:

(A) 0.15	(B) 0.40	(C) 0.66	(D) 0.20

(37) The probability that a selected student who wears a tie come from the East is:

(A) 0.452	(B) 0.218	(C) 0.352	(D) 0.606

Question No. 12

(38) A lower bound value according to Chebyshev's theorem for $P(\mu - 3\sigma < X < \mu + 3\sigma)$ is:

(A) 0.3175	(B) 0.750	(C) 0.250	(D) 0.889

(39) If Y= 3X - 1.5 and E(X)= 0.5, then E(Y) is:

(A) 0.0	(B) 0.4	(C) 0.51	(D) 1.3

(40) If X is a continuous random variable with a mean $\mu = 16$ and a variance $\sigma^2 = 5$, then P (X = 7) is:

(A) 0. 26	(B) 0.61	(C) 0.0	(D) 0.25

Question No. 13

Let X be a random variable having a discrete uniform distribution with parameter $k = 3$ and with values 0, 1, and 2. Then:

(41) The mean of X is:

(A) 1.5	(B) 2	(C) 1	(D) 0.3

(42) The variance of X is:

(A) 5	(B) 1	(C) 1.33	(D) 0.67

Question No. 14

A study by the traffic police claims that only 20% of the drivers in Riyadh fasten their seat belts. A sample of 10 drivers in Riyadh has been taken randomly.

(43) The probability of observing at least two drivers in the sample fastening their seat belts is:

(A) 0.123	(B) 0.624	(C) 0.376	(D) 0.678

(44) The expected number of drivers in the sample fastening their seat belts is:

(A) 2	(B) 4	(C) 10	(D) 1.8

(45) The variance of the number of drivers in the sample who fasten their seat belts is:

(A) 3.7	(B) 4.5	(C) 2.3	(D) 1.6

Question No. 15

Suppose that the number of faults in a fiber optic cable follows a Poisson distribution with an average of 0.6 per 1000 feet.

(46) The probability of at most one fault per 1000 feet of such cable is:

(A) 0.8781	(B) 0.6769	(C) 0.2351	(D) 0.5631

(47) The probability of 2 faults per 500 feet of such cable is:

(A) 0.0988	(B) 0.0333	(C) 0.9769	(D) 0.0615

(48) The variance of the number of faults per 500 feet of such cable is:

(A) 0.39	(B) 0.19	(C) 0.30	(D) 0.65

Question No. 16

The waiting time, in minutes, between successive speeders spotted by a radar unit is a continuous random variable with the following density function:

$$f(x) = \begin{cases} \frac{1}{5} e^{-\frac{x}{5}}, & x > 0, \\ 0, & \textit{otherwise} \end{cases}$$

then:

(49) The probability that the waiting will be more than 8 minutes between successive speeders is:

(A) 0.2019	(B) 0.5981	(C) 0.8971	(D) 0.7562

(50) The expected value, in minutes, of the waiting time is:

(A) 225	(B) 125	(C) 25	(D) 5