SRS_ESE-402-401 2021C Midterm

Sheil Sarda

TOTAL POINTS

71 / 100

QUESTION 1

1 1a 5 / 5

✓ **- 0 pts Correct**

- 2 pts Graph is not clearly asymmetric.

- 2 pts Linear combination of pdfs is not linear combination of random variables (pdf that is sum of gaussian pdfs is not gaussian; random variable that is sum of gaussian random variables is gaussian).

- 3 pts Peaks at incorrect location(s).

- 2 pts Graphed individual gaussian(s).

- 5 pts Graph missing.

QUESTION 2

2 1b 10 / 10

✓ **- 0 pts Correct**

- 2 pts Incorrect/missing work for $$\mathbb{E}[X]$$

- 2 pts Incorrect work for $$\mathbb{E}[X^2]$$.

- 3 pts Incorrect/missing work for $$\text{Var}[X]$$

- 2 pts Used algebra/definition of second moment $$\mathbb{E}[X^2]$$ instead of variance.

- 3 pts Incorrect approach (e.g. claiming distribution is gaussian)

- 1 pts Miscellaneous minor algebra mistakes.

- 10 pts Missing / largely incomplete.

QUESTION 3

3 1c 7 / 7

✓ **- 0 pts Correct**

- 1 pts Miscellaneous algebra errors.

- 1 pts Wrote estimator in terms of true moments, e.g. $$\mu$$.

- 4 pts Incorrect estimator

- 7 pts Missing/incomplete.

- 7 pts Did not apply method of moments.

QUESTION 4

4 1d 4 / 4

✓ **- 0 pts Correct**

- 2 pts Incorrect justify or estimator

- 4 pts Incorrect justify and estimator

QUESTION 5

5 1e 4 / 8

- 0 pts correct

- 1 pts correct interval expression, lack final relation between beta' and beta

- 2 pts follow-through: wrong relations from previous questions

- 2 pts algebraic error

✓ **- 4 pts wrong justify/result**

- 4 pts correct answer with no deduction

- 8 pts incorrect

QUESTION 6

6 1f 8 / 8

✓ **- 0 pts Correct**

- 2 pts Missing a factor of 2 (due to incorrectly using CLT on p_hat instead of mu_hat and setting beta incorrectly) or $$\sqrt{n}$$ (did not set beta correctly), but otherwise okay.

- 7 pts wrong answer, but wrote down something

- 6 pts Incorrect approach (ML/fisher info)

- 8 pts missing

- 4 pts left in terms of $$\sigma$$ without explanation

- 3 pts left in terms of beta without explanation (CI should be left in terms of sigma and n), i.e. didn't set beta correctly

- 4 pts Wrote down confidence interval formula without further explanation/simplification

- 1 pts plugged in variance or sigma incorrectly

- **3 pts** did not simplify and leave in terms of p, n
- **3 pts** Incorrect approach: used beta incorrectly

QUESTION 7

7 1g **8 / 8**

✓ **- 0 pts good**

- **2 pts** final answer in terms of u and M
- **1 pts** E[X] = a(1-2p)
- **1 pts** a = sqrt(E[x^2] - 1)
- **1 pts** a = sqrt(E[x^2] - 1)
- **1 pts** Did not provide the right equations required for the final answer
- **2 pts** The expression provided does not yield the required solution (OR) stopped short after calculating E[X] and E[X^2]. "a" and "p" value was not provided
- **1 pts** equation. P = 1/2 - 1/2 x (M1/ sqrt(M2 - 1))
- **1 pts** mistake in denominator of p
- **1 pts** p = 1/2 - 1/2 x (M1/sqrt(M2 - 1))
- **1 pts** a = sqrt(sigma(X^2)/n - 1)
- **8 pts** not attempted

QUESTION 8

8 2a **5 / 5**

✓ **- 0 pts Correct**

- **5 pts** Totally wrong. Didn't mention that $$X_1,X_2,...,X_N$$ are independent
- **3 pts** Did some useful math but still didn't mention that $$X_1,X_2,...,X_N$$ are independent
- **1 pts** Click here to replace this description.

QUESTION 9

9 2b **10 / 15**

- **0 pts** Correct

✓ **- 5 pts Should not take any Expectation / Should not use bar-X**

- **2 pts** Algebraic mistakes
- **2 pts** Carry through
- **5 pts** Method wrong / missing
- **15 pts** All wrong
- **5 pts** Did not use equations provided as it can be further simpfied.

QUESTION 10

10 2c **8 / 20**

- **0 pts** Correct
- **5 pts** The mathematical derivation of $$T(X_1,X_2,...,X_n)$$ is wrong.

✓ **- 2 pts The mathematical derivation of $$T(X_1,X_2,...,X_n)$$ is partially wrong.**

✓ **- 2 pts The variance $$var(|X|)$$ is wrong, or didn't calculate the variance $$var(|X|)$$**

✓ **- 5 pts Didn't apply the CLT to $$\frac{1}{n}\sum_{i=1}^n|X_i|$$**

- **2 pts** the CLT to $$\frac{1}{n}\sum_{i=1}^n|X_i|$$ is wrong

✓ **- 3 pts The final Gaussian distribution is wrong**

- **2 pts** The final Gaussian distribution is partially wrong
- **20 pts** Not attempted

QUESTION 11

11 2d **2 / 10**

- **0 pts** Correct
- **3 pts** Result wrong, but acceptable approach (given part c)
- **1 pts** algebraic mistakes
- **3 pts** Carry Through Mistakes, but otherwise generally correct (e.g. derived a LRT and described acceptance region)
- **1 pts** incorrect sign of z-score, otherwise correct
- **9 pts** Wrong result with no related works
- **10 pts** missing

✓ **- 8 pts did not describe a rejection region**

- **5 pts** Wrong approach
- **5 pts** Wrong result with plenty related works

1 1a **5 / 5**

✓ **- 0 pts Correct**

- 2 pts Graph is not clearly asymmetric.

- 2 pts Linear combination of pdfs is not linear combination of random variables (pdf that is sum of gaussian pdfs is not gaussian; random variable that is sum of gaussian random variables is gaussian).

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3 1c **7 / 7**

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- 4 pts Incorrect estimator

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- 7 pts Did not apply method of moments.

4 1d **4 / 4**

✓ **- 0 pts** **Correct**

- 2 pts Incorrect justify or estimator

- 4 pts Incorrect justify and estimator

5 1e **4 / 8**

- **0 pts** correct
- **1 pts** correct interval expression, lack final relation between beta' and beta
- **2 pts** follow-through: wrong relations from previous questions
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- **4 pts** correct answer with no deduction
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6 1f **8 / 8**

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- 1 pts a = sqrt(E[x^2] - 1)

- 1 pts a = sqrt(E[x^2] - 1)

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- 1 pts equation. P = 1/2 - 1/2 x (M1/ sqrt(M2 - 1))

- 1 pts mistake in denominator of p

- 1 pts p = 1/2 - 1/2 x (M1/sqrt(M2 - 1))

- 1 pts a = sqrt(sigma(X^2)/n - 1)

- 8 pts not attempted

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