UNIVERSITY OF TORONTO SCARBOROUGH

Department of Computer and Mathematical Sciences

STAC67H3F: Regression Analysis

Quiz 2: written part

TUT0002 · Wednesday November 4, 2026

Instructions

- **Quiz 2 has two parts.** This **written part** (25 minutes, 12 points) comes first, on paper. The **Quercus part** (25 minutes, 8 points) follows, on your laptop, once this paper has been collected. Quiz 2 is marked out of 20.
- **Keep your laptop closed and your phone away** until this paper has been collected. A non-programmable calculator is permitted; no other aids.
- Answer in the space provided on pages 2 and 3. This booklet is scanned: anything written elsewhere is not marked. **Do not write on the QR codes** at the top of the pages.
- Show your work: a number with no supporting work receives no credit.
- Round *final* answers to 2 decimal places; do not round intermediate quantities.

Good luck!

1. A café records, on $n = 20$ summer days, the number Y of **iced drinks** sold, the **maximum temperature** x_1 of the day (in °C, from 21 to 29) and the number of **hours of sunshine** x_2 (from 7 to 14). The model is $Y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \varepsilon_i$, with $\varepsilon_1, \ldots, \varepsilon_{20}$ independent $N(0, \sigma^2)$. With $\boldsymbol{X}$ the 20×3 design matrix (its columns are a column of ones, x_1 and x_2), the following quantities are computed:

$$(\boldsymbol{X}'\boldsymbol{X})^{-1} = \begin{bmatrix} 7.35 & -0.26 & -0.08 \\ -0.26 & 0.012 & -0.004 \\ -0.08 & -0.004 & 0.018 \end{bmatrix}, \qquad \boldsymbol{X}'\boldsymbol{Y} = \begin{bmatrix} 1600 \\ 40\,380 \\ 16\,140 \end{bmatrix},$$

$$\boldsymbol{Y}'\boldsymbol{Y} = 130\,000, \qquad SSE = 340.$$

   (a) Compute the least squares estimates $\hat{\beta}_1$ and $\hat{\beta}_2$ (you do not need $\hat{\beta}_0$), and interpret $\hat{\beta}_1$ in the context of the study. [3]

Quantiles of the Student distribution: $t(p;\nu)$ is the p quantile of $t(\nu)$.

ν	$t(0.90;\nu)$	$t(0.95;\nu)$	$t(0.975;\nu)$	$t(0.99;\nu)$
15	1.341	1.753	2.131	2.602
16	1.337	1.746	2.120	2.583
17	1.333	1.740	2.110	2.567
18	1.330	1.734	2.101	2.552
19	1.328	1.729	2.093	2.539
20	1.325	1.725	2.086	2.528
21	1.323	1.721	2.080	2.518
22	1.321	1.717	2.074	2.508
23	1.319	1.714	2.069	2.500
24	1.318	1.711	2.064	2.492

(b) Give a 95% confidence interval for β_2, and interpret it in context. [5]

(c) Compute the adjusted coefficient of determination R_a^2 for this model. (Recall that $SST = \sum_{i=1}^n Y_i^2 - n\bar{Y}^2$.) [4]