Simulation 442: A2 and A3 – 2025

James Bekker

October 17, 2025

Outline

Admin

The exam: A2 & A3

Formulas given

Inquisitive

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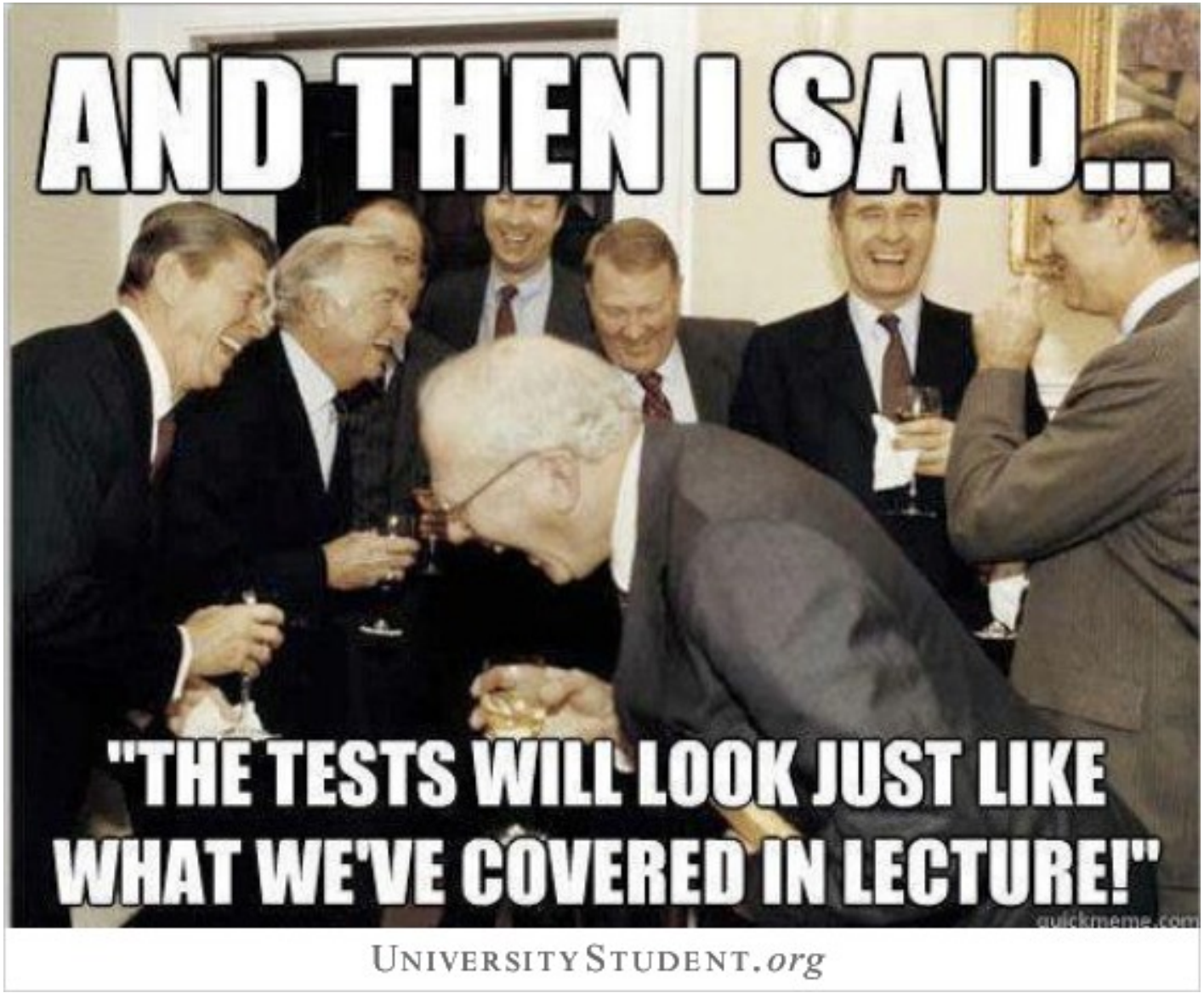

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- There are notes of students of previous years in circulation – some of their model answers are wrong.

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- Why do all the models have upper bounds for their throughput?
- Why can the trauma unit be considered a production line?

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- In the (r, Q) model, why was the total inventory cost still high when r and Q both had low values?

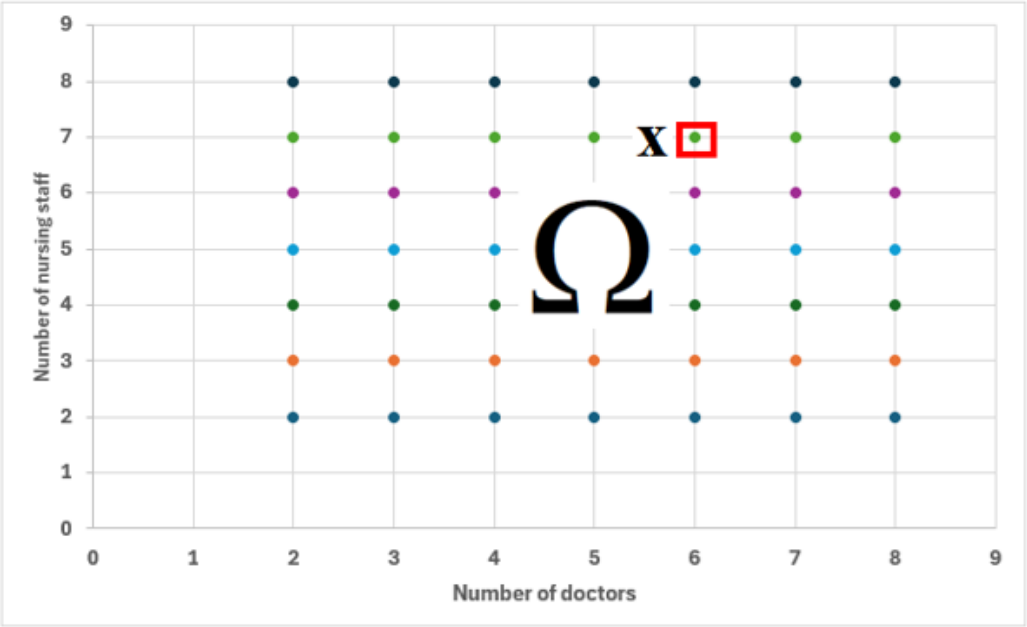
Guidelines for the exam

6.6 Multi-objective optimisation problem formul

The MOO problem with K objectives and $M+Q$ constra
2008):

$$\begin{aligned} \text{Minimise } \mathbf{f}(\mathbf{x}) &= [f_1(\mathbf{x}), f_2(\mathbf{x}), \ldots, f_K(\mathbf{x})]^T \\ \text{subject to } \mathbf{x} &\in \Omega \\ \Omega &= \{\mathbf{x} \mid g_i(\mathbf{x}) \leq 0, i = 1,2,\ldots,M; \\ h_j(\mathbf{x}) &= 0, j = 1,\ldots,Q\}. \end{aligned}$$

Trauma unit:



$f_1(\mathbf{x})$ = Patient turn-around time

$f_2(\mathbf{x})$ = Cost

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- Both papers require insight and deep understanding of the work covered.

Scale of difficulty

Formules gegee

$$\chi^2 = \sum_{i=1}^{k} \frac{(E_i - O_i)^2}{E_i}$$

$$h = t_{n-1;1-\frac{\alpha}{2}} \frac{S_{\overline{x}}}{\sqrt{n}}$$

$$C_{ij} = \frac{\sum_{i=1}^{n-j}(X_i - \bar{X})(X_{i+j} - \bar{X})}{n-j}$$

$$n^* = \left\lceil n \left(\frac{h}{h^*} \right)^2 \right\rceil$$

$$P(X \in E) = \sum_{\omega \in A} p(\omega)\delta_\omega(E)$$

Expon:

$$f(x) = \frac{1}{\beta} e^{-(x/\beta)}, \quad x > 0$$

Formulas given

$$D_n^+ = \max_{1 \le i \le n} \left\{ F_n(X_j) - \hat{F}(X_j) \right\}$$

$$D_n^- = \max_{1 \le i \le n} \left\{ \hat{F}(X_j) - F_n(X_{j-1}) \right\}$$

$$D_n = \max\{D_n^+, D_n^-\}$$

$$\rho_j = C_{ij}/S_X^2$$

$$S^2 = \frac{\sum_{i=1}^{n}(X_i - \overline{X})^2}{n-1}$$

$$k = \lfloor 1 + 3.322 \log_{10} n \rfloor$$

Poisson:

$$f(x) = e^{-\lambda} \frac{\lambda^x}{x!}, \quad x = 0, 1, 2, \ldots$$

Be inquisitive

I asked cheatGPT:

Is it acceptable to put Marmite on braaibroodjie?

Yes, it's absolutely acceptable to put Marmite on a braaibroodjie! In fact, it can add a unique, savory flavor to the sandwich. Marmite's umami richness pairs well with the traditional ingredients like cheese, tomato, and onion, giving the sandwich a more complex taste. Braaibroodjies are all about personal preference, so if you enjoy the bold flavor of Marmite, go for it! Just be mindful of balancing it with the other flavors.

Is it acceptable to put jelly babies on a braaibroodjie?

While it's certainly unconventional, putting jelly babies on a braaibroodjie is acceptable if you're feeling adventurous or enjoy a mix of sweet and savory flavors. The traditional braaibroodjie usually features cheese, tomatoes, onions, and chutney, so jelly babies would create a dramatic contrast with their sweetness and chewy texture.

That said, this combination might not be for everyone, but experimenting with new flavors is part of the fun of cooking. If you're curious about unusual combinations, why not give it a try and see how it turns out? It could be a hit at your next braai—or at least a conversation starter!

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  1. Exam
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