

LOG307

End-of-Course Assessment - January Semester 2023

Optimisation and Simulation for Decision-Making

INSTRUCTIONS TO STUDENTS:

1. This End-of-Course Assessment paper comprises **9** pages (including the cover page).
2. You are to include the following particulars in your submission: Course Code, Title of the ECA, SUSS PI No., Your Name, and Submission Date.
3. Late submission will be subjected to the marks deduction scheme. Please refer to the Student Handbook for details.

IMPORTANT NOTE

ECA Submission Deadline: Friday, 28 April 2023 12:00 pm

ECA Submission Guidelines

Please follow the submission instructions stated below:

A - What Must Be Submitted

*You are required to submit the following **THREE (3)** items for marking and grading:*

- *A Report (you **should submit this item first** as it carries the highest weightage).*
- *A Video Presentation: Refer to Canvas L/LG course site's announcement on "ECA Video Submission Technical Know How", which will be posted three weeks before the ECA cut-off date.*
- *The set of PowerPoint slides, converted to PDF, upon which the video presentation is based.*

*Please verify your submissions after you have submitted the above **THREE (3)** items.*

B - Submission Deadline

- *The **THREE (3)** items of Report, Video and Presentation Summary are to be submitted by **12 noon** on the submission deadline.*
- *You are allowed multiple submissions till the cut-off date for each of the **THREE (3)** items.*
- *Late submission of any of the **THREE (3)** items **will be subjected to mark-deduction scheme** by the University. Please refer to Section 5.2 Para 2.4 of the Student Handbook.*

C - How the (3) Items Should Be Submitted

- *The Report: submit online to Canvas via TurnItIn (for plagiarism detection)*
- *The Video: submit online to Canvas (refer to Canvas L/LG course site's announcement on "ECA Video Submission Technical Know How", which will be posted three weeks before the ECA cut-off date.)*
- *The Presentation Summary:*
 - *Submit online to Canvas via TurnItIn (PPT must be converted to PDF and submission is in PDF only)*
 - *The PPT must contain at least 20 words*

- Avoid using a public WiFi connection for submitting large video files. If you are using public wireless (WiFi) connection (e.g. SG Wireless at public areas), you might encounter a break in the connection when sending large files.

D - Additional guidelines on file formatting are given as follows:

<p>1. Report</p>	<ul style="list-style-type: none"> • Please ensure that your Microsoft Word document is generated by Microsoft Word 2016 or higher. • The report must be saved in .docx format.
<p>2. Video</p>	<ul style="list-style-type: none"> • Showing your PowerPoint projection in the background is NOT required. • Time Duration: a minimum of 3 minutes and a maximum of 6 minutes <p>There are two methods for ECA video assignment submission; either Record Media or Upload Media.</p> <p><u>For Record Media</u> Video can be recorded via Canvas through desktop/laptop with built-in webcam and microphone or through Canvas mobile app. Live recording duration must be less than 10 minutes. No file size limit for live recording.</p> <p><u>For Upload Media</u> Video can be recorded using other recording devices and uploaded as a media file. Do ensure that your video file conforms to these requirements: a) File Format: .mp4 b) File Size: No more than 500MB</p> <p>Note: Refer to Canvas L/LG course site's announcement on "ECA Video Submission Technical Know How", which will be posted three weeks before the ECA cut-off date.</p>

3. Presentation Summary	<ul style="list-style-type: none"> • <i>Your PowerPoint presentation must contain at least 20 words.</i> • <i>Please ensure that your PowerPoint presentation is converted to PDF format before you submit.</i> • <i>The maximum number of slides is fifteen (15).</i> • <i>Please do NOT download and use PowerPoint slide design templates from the Internet.</i>
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E - Please be Aware of the Following:

Submission in hardcopy or any other means not given in the above guidelines will not be accepted. You do not need to submit any other forms or cover sheets (e.g. form ET3) with your ECA.

You are reminded that electronic transmission is not immediate. The network traffic may be particularly heavy on the date of submission deadline and connections to the system cannot be guaranteed. Hence, you are advised to submit your work early.

Canvas will allow you to submit your work late but your work will be subjected to the mark-deduction scheme. You should therefore not jeopardise your course result by submitting your ECA at the last minute.

It is your responsibility to check and ensure that your files are successfully submitted to Canvas.

F - Plagiarism and Collusion

Plagiarism and collusion are forms of cheating and are not acceptable in any form in a student's work, including this ECA. Plagiarism and collusion are taking work done by others or work done together with others respectively and passing it off as your own. You can avoid plagiarism by giving appropriate references when you use other people's ideas, words or pictures (including diagrams). Refer to the APA Manual if you need reminding about quoting and referencing. You can avoid collusion by ensuring that your submission is based on your own individual effort.

The electronic submission of your ECA will be screened by plagiarism detection software. For more information about plagiarism and collusion, you should refer to the Student Handbook (Section 5.2.1.3). You are reminded that SUSS takes a tough stance against plagiarism or collusion. Serious cases will normally result in the student being referred to SUSS's Student Disciplinary Group. For other cases, significant mark penalties or expulsion from the course will be imposed.

Video Presentation Evaluation Criteria

Note: *Students will be assessed on the quality of the presentation and not the quality of the video recording. However, the recording is expected to have video and audio clarity. Showing your PowerPoint projection in the background is **NOT** required.*

Organisation of Presentation □ /8

- Logical flow of presentation

Posture & Body Language □ /5

- Posture: Standing, straight back etc...
- Body language:
 - Hand gestures supporting oral arguments, etc...

Eye-Contact □ /5

- Looking at the video camera
- No reading of slides or notes or cue cards

Pace & Articulation □ /7

- Pace: Speaks neither too fast nor too slow
- Articulation: Oral expression is clear and confident in the presentation.

TOTAL □ /25

Presentation Summary Evaluation Criteria

Format and Style of Slides □ /3

- Layout, clarity of text elements, colour blends, graphical enhancements

Clarity and Coherence □ /4

- Proper flow - title page, introduction, body, results, recommendations / discussion points, conclusion/summary; quick to understand, free from grammatical errors

Creativity □ /3

- Ability to use creative elements to value-add to the presentation so as to enhance understanding and clarity of difficult concepts

TOTAL □ /10

(Full marks: 100)

SECTION A (65 marks)

Answer all questions in this section.

For Section A, you are required to submit 2 files:

- A report (in word doc, submit via **ECA_REPORT**), answering Questions 1 and 2
- An Excel file (submit via **Excel_ECA**). You should use Excel to work on your model. You should use **separate sheets** for answering different questions and name the sheets based on the question number e.g., Q1a, Q1b, Q2 etc. In the report, you should insert a **screenshot** of the Excel sheet showing your models.

Question 1

A university plans to build a new computer lab for its students for data analysis and simulation modelling. It has determined the number of computers needed each month for the next 12 months based on the student enrollment, as given in Table 1.

Table 1: Number of computers needed

Month	1	2	3	4	5	6
Requirements	60	60	60	80	80	20
Month	7	8	9	10	11	12
Requirements	20	60	70	70	80	80

The university is wondering whether to rent the computers or buy new computers. Computers can be rented for a period of one, two, or three months. Table 2 shows the cost of renting.

Table 2: Cost of renting

Duration of rent	Cost
1	\$250
2	\$450
3	\$650

The university does not have any computers at the start of the year.

Question 1a

Apply linear programming (LP) to formulate the problem to determine the number of computers the university should rent each month and for how long, so that the total cost of renting is minimum.

(5 marks)

Question 1b

Solve the LP model in Question 1a by developing a spreadsheet model.

How many computers should the university rent each month and for how long? What is the optimal cost of renting?

You can assume that fractional rental is possible. Present your solutions by rounding up or down the number.

(12 marks)

Question 1c

How does the model change if the university has 50 computers at the start of the year? Is there any change in the solution obtained in Question 1a?

(8 marks)

Question 1d

If the university wants the solution only in integer numbers, what amendments need to be done to the previous model?

Solve for the best solution in this case.

(5 marks)

Question 2

A motorcycle manufacturing company plans to launch a new motorcycle model in the ASEAN market. The company is considering to set up a manufacturing plant in Batam but is struggling to determine the capacity for the plant. Capacities of 10,000, 12,000, 14,000, 16,000, 18,000 and 20,000 units are being considered.

To build a unit of capacity, the company has to incur \$5,000, but that cost can be divided equally for the next four years. There is also a fixed maintenance cost for keeping the capacity, given by $\$(X + 1) \times 50$ per year, where X is the last digit of your PI number, e.g., if your PI number is B1234567, $X = 7$ and the maintenance cost = $\$(7 + 1) \times 50 = \400 per year.

It is expected that the demand for the motorcycle for the next four years would be normally distributed, with a mean of 13,000 and standard deviation of 3,000 motorcycles. The demand of motorcycles each year does not impact the demand the next year. Each motorcycle will be sold at \$10,000 with a production cost of \$7,500. The profits generated are discounted at 4% annual interest.

The company does not want to keep inventory from one year to another and is planning only for the next four years.

Question 2a

Construct a simulation model to determine the net present value (NPV) for different potential capacities. Find the optimal capacity level of the plant, based on the mean NPV. Mention all the settings used for the simulation model.

(25 marks)

Question 2b

Using the result and output chart obtained in Question 2a, determine the value of the NPV that has 5% chance that the actual NPV will exceed it.

(5 marks)

Question 2c

Suppose the company is averse to risk, i.e., it does not want to go for a capacity with too much variability in the NPV. Analyse whether the optimal solution obtained in Question 2a will change.

(5 marks)

SECTION B (25 marks)

Prepare a video recording of the presentation of at least 3 minutes but not exceeding 6 minutes. There are two methods for ECA video assignment submission; either Record Media or Upload Media. For Upload Media, please note that your file size should be no more than 500MB and the format is in .mp4.

(25 marks)

SECTION C (10 marks)

Prepare a set of PowerPoint presentation slides upon which the video presentation is based. Please note that the PowerPoint must be converted to PDF before submission to Canvas.

(10 marks)

----- END OF ECA PAPER -----