Name:	
Student ID:	

Midterm & Final Examinations

Phys778: Bootstrap Methods in Physics II

Writing-Midterm — 2025/05/10
Oral-Final — 2025/05/(15&22)

- Students are to choose a topic from the list available at the end of the document Phys777 exams for the semester 20241 (which is also provided at the end of this document for their convenience); they are advised to choose the same topic that they had chosen for their oral midterm and discussion final in Phys777.
- Each student will prepare *a fictitious grant-application* in that topic: further details are discussed below.
- The grading of the course is based on the following scores:
  1. *The writing-midterm (50 points)*: students will submit their grant proposal document as their midterm.
  2. *The oral-final (50 points)*: students will give a talk about their grant proposal as their final.
  3. *The bonus homework (up to 50 points)*: students might do homeworks to get extra credit: details are listed below.

MORE ON MIDTERM & FINAL

- We are going to assume that the students have just finished their PhD's, found a researcher abroad to work with, and hence are going to apply to the TUBITAK grant *2219 - International Postdoctoral Research Fellowship Program for Turkish Citizens*. Note that we chose this scneario as all enrolled students in this particular semester are of nationality Turkey.
- Students shall prepare a *research proposal form* as their midterm. One can access for the template of this form over here; a pdf version retrived on March 10, 2025 is appended to the end of this document.
- I would like to emphasize this: *I will not grade based on how well an actual research idea you come up with*! The point of this exercise is for you to experience first-hand in a course setting how complicated a grant proposal writing process can get and how many different aspects of a research project you actually need to think about while applying for funds. Indeed, during a standard graduate study, you do not ordinarily think about things like *excellence of research, impact of research, how your research will strengthen the competitiveness of Turkey in strategic areas, how you plan to dissiminate your results, work packages of your planned research, your risk management plan* and so on. For more details about my grading, see rubric near the end of the document.
- Students will also prepare a talk, supposedly to be delivered to an evaluation jury for the grant. They will give this talk as their final exam.
- Students will email *both their research proposal form and their final talk* by 23:59 on May 11th, both in pdf format. They will lose 20 points per document per day, should they send them late.

Name:	
Student ID:	

MORE ON BONUS HOMEWORK

- Since all enrolled students in this particular semester are Turkish speaking, we will have a unique bonus exam type: *Wikipedia homeworks*. Below in the document, a list of Wikipedia pages about various bootstrap topics and related fields are provided; and all these pages have something in common: they are not available in Turkish. Students will have a chance to obtain bonus points by creating corresponding Turkish pages.
- On March 20th, two of the founding members (Başak Tosun, Zafer Batık) of *Wikimedia Community User Group Turkey* will visit us and give an introductory talk (about how to use Wikipedia, how to edit pages, etc.): you will then be provided accounts to create pages, which will be subjected to my review before going public.
- All students are free to create as many pages as they would like (please do at least one); they will get 10 points per page (they can get at most 50 points from bonus homeworks in total).

  Please note that Vikipedi volunteers already do an excellent job at using online translators, ai tools, and other modern techniques to translate foreign wikipedia pages to Turkish. However, such translations are inherently limited and are subpar compared to translations supervised by experts of the field such as students of this class (see other efforts to bridge scientists and Wikipedians to improve the status of Turkish Vikipedi). This homework therefore gives you both an opportunity to get a higher grade and an opportunity to make meaningful contributions to the Vikipedi project!
- Students can choose one of the pages below to create the corresponding Turkish page (translate what's available in the English page and then extend depending on your knowledge and what we have covered in the classes):

  - Banks-Zaks fixed point
  - Beta function
  - Boundary conformal field theory
  - Callan Symanzik equation
  - Conformal field theory
  - Conformal symmetry
  - ds/cft correspondence
  - Infrared fixed point
  - Liouville field theory
  - Logarithmic field theory
  - Operator product expansion
  - Primary field
  - Rational conformal field theory
  - Renormalization group
  - Scale invariance
  - Scaling dimension
  - Special conformal transformation
  - Two dimensional conformal field theory
  - Two dimensional critical ising model
  - Ultraviolet fixed point
  - Virasoro algebra

  These pages are to get you started; you can (1) go to these pages, (2) click on "see also" from the left menu, and (3) check out other related pages to find more pages to create Turkish versions (please also check if your page has already a Turkish translation by checking the available languages next to the title at the top of the page)!

  Not all these pages are of equal content; for instance, English versions of renormalization group and ds/cft correspondence have around 5700 and 300 words respectively. So you are free to work together on large pages, or just work on a single long page yourself to get the maximum credit from the bonus homework (I would happily award 50 points to a proper translation of that long single page).

Name:	
Student ID:	

FINAL TIMES

- There will not be class on the exam days; instead, students will have their exam at P432 in the time slot assigned to them based on their ID numbers:

2025/05/15				**2025/05/22**		
2555357	2555100	2496172	2422814	2372100	2033611	1941459
13:40-14:20	14:25-15:05	15:10-15:50	15:55-16:35	13:40-14:20	14:25-15:05	15:10-15:50

- The time slots coincide with the class hours, so you should not have any academic conflict in principle. Nevertheless, students are allowed to change their slots among each other provided they inform the instructor beforehand.
- Since the schedule is rather tight, there is no room for reschedule if the student misses their appointment. You are allowed a make-up if you have a medical report (for further details, see https://soneralbayrak.com/teaching/MyTeachingPolicy)

MIDTERM GRADING RUBRIC

Question: 1 ..... *(10 points)*
The proposal has a solid convincing summary with properly chosen keywords.
☐ 0 ☐ 2 ☐ 4 ☐ 6 ☐ 8 ☐ 10

Question: 2 ..... *(10 points)*
Excellence of the research section is well written and convincing.
☐ 0 ☐ 2 ☐ 4 ☐ 6 ☐ 8 ☐ 10

Question: 3 ..... *(10 points)*
Impact of the research section is well written and convincing.
☐ 0 ☐ 2 ☐ 4 ☐ 6 ☐ 8 ☐ 10

Question: 4 ..... *(10 points)*
Implementation of the research section is well written and convincing.
☐ 0 ☐ 2 ☐ 4 ☐ 6 ☐ 8 ☐ 10

Question: 5 ..... *(10 points)*
There are no scientific errors or contradictions in the proposal.
☐ 0 ☐ 2 ☐ 4 ☐ 6 ☐ 8 ☐ 10

FINAL GRADING RUBRIC

Question: 1 ..... *(10 points)*
The talk was professional: the speaker seemed confident and sufficiently knowledgeable about their talk; they spoke at a pace easy to follow; they handled questions well, and so on.
☐ 0 ☐ 2 ☐ 4 ☐ 6 ☐ 8 ☐ 10

Name:	
Student ID:	

Question: 2 ..... *(10 points)*
The talk had a conclusion/summary part that wrapped up all important points; it included a quick discussion of the current literature, the open directions in the field, and how the proposed projects is related to these; and so on.

☐ 0 ☐ 2 ☐ 4 ☐ 6 ☐ 8 ☐ 10

Question: 3 ..... *(10 points)*
The talk was prepared in a manner to be appropriate for the allocated time, and the speaker delivered it so that it was neither over too early nor was it unfinished by the end of the time.

☐ 0 ☐ 2 ☐ 4 ☐ 6 ☐ 8 ☐ 10

Question: 4 ..... *(10 points)*
The student did not simply memorize things but actually understood the content and its physical importance, and firmly made their case as to why their project should be funded.

☐ 0 ☐ 2 ☐ 4 ☐ 6 ☐ 8 ☐ 10

POSSIBLE TOPICS
Below is the same list of possible topics that could be chosen for Phys777, provided here for the convenience. Students should choose one from these —I would advice them to choose same topic that they have chose for Phys777.

- **Symmetries in QFT,** for instance https://doi.org/10.1016/0370-2693(80)90212-9 and https://inspirehep.net/literature/796886
- **General Conformal Field Theories,** for instance arXiv:hep-th/9810192, arXiv:0803.1467, arXiv:0807.0004, arXiv:1105.4598, arXiv:1107.3987, and arXiv:1112.1016.
- **2D CFTs,** for instance https://doi.org/10.1016/0550-3213(84)90052-X, https://doi.org/10.1016/0550-3213(88)90179-4, https://doi.org/10.1016/0550-3213(86)90552-3
- **AdS/CFT Theory,** for instance arXiv:hep-th/9803131, arXiv:hep-th/9903196, arXiv:hep-th/0112258, arXiv:hep-th/0210114, arXiv:hep-th/0605073, arXiv:0907.0151.
- **Warped Extra Dimensions,** for instance arXiv:hep-ph/9905221, arXiv:hep-ph/9907447, arXiv:hep-ph/0003129, arXiv:hep-ph/0308036.
- **Other AdS/CFT Applications,** for instance arXiv:hep-ph/0602229, arXiv:0803.3295, arXiv:0804.4053, arXiv:0804.3972.
- **CFTs at Colliders,** for instance arXiv:hep-ph/0703260, arXiv:0708.1463, arXiv:0801.1140.
- **Superconformal Theories,** for instance arXiv:hep-th/9411149, arXiv:hep-th/9407087, arXiv:hep-th/9712074, arXiv:hep-th/0304128

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RESEARCH PROPOSAL FORM

The proposal form should not exceed 5 (five) pages and expected to be prepared in Arial 11 font. Form must fill in taking into account the explanations given under each topic. Instructions, which colored in gray for the proposal form, should be deleted.

2219 International Postdoctoral Research Fellowship Programme for Turkish Citizens

Name of the Researcher (Fellow):
Name of the Research:
Name of the Host:
Host Institution:
Date:

SUMMARY OF THE RESEARCH PLAN PROPOSAL

Brief summary (max. 1,500 characters, with spaces) of the research plan. (The short abstract of your research plan should summarize the main goals and contents of the research you plan to do in host institution.)
Keywords (up to 5) to define your particular research topic at the host institute:

1. EXCELLENCE OF THE RESEARCH

1.1. Importance of the Subject, Scientific Excellence of the Research and Question/Hypothesis

Please describe the overall aims and scientific/technical objectives of the research in detail with clear and brief statements. The objectives should be measurable, realistic and achievable within the duration of the research. Objectives should be consistent with the expected exploitation and impact of the research (see section 2). Please describe the current national and international state of the art in the domain addressed by the research (present a literature review including, if applicable, patent/utility model/market research relevant to the research). The scope, limits and importance of the subject matter discussed in the research proposal are explained by a critical evaluation of the literature as well as by qualitative or quantitative data. All necessary references should be given in ANNEX-1: REFERENCES. **Describe the advance of your research proposal would provide beyond the state-of-the-art, and the extent of the proposed work is ambitious**. Please describe the scientific quality and innovation potential of the research as well as its methodological/conceptual/theoretical contribution to the related scientific and technological area, highlighting the expected progress beyond the state of the art. The interdisciplinary/multidisciplinary characteristics should also be clearly stated.

2219 International Postdoctoral Research Fellowship Programme for Turkish Citizens

2. IMPACT OF THE RESEARCH

2.1 Expected impacts

Describe the expected impact(s) of the research in relation to the research objectives. Please indicate the potential of the research results to solve economic/commercial/social/environmental problems.
Describe the innovation potential **(e.g. ground-breaking objectives, novel concepts and approaches, new products, services or business and organizational models)** which the proposal represents. Where relevant, refer to products and services already available on the market. Please refer to the results of any patent search carried out.

Wherever possible, use quantified indicators and targets for the expected outputs, results and impacts (Product, Prototype, Patent, Utility model, Production license, Process Improvement, Variety registry, Spin-off/Start-up company, Audiovisual archive, Inventory / Database / Documentation Production, Work that can be copyrighted, social impact, environmental impact and other common effects).

For the researchers aiming new product development, please also answer the following questions;

- Describe the added value of the research that will strengthen the competitiveness and growth of companies by developing innovations meeting the needs of Türkiye; and, where relevant, by delivering such innovations to the markets.
- Explain the commercialization potential and domestic/international market share of research output(s) including a brief comparison with other potentially competing products or services and its possibility to replace an imported product.

3. IMPLEMENTATION OF THE RESEARCH

3.1. Methodology

Methods must be rigorous and appropriate to the proposed research questions or hypotheses. Design, methods, and analytic techniques should have a coherent and logical link. Research methods should be described in adequate detail. Methods must be associated with work packages. Methodology should make it clear how the research design and analyses answer the research questions (Include a description of study population and sampling method, sample size, expected effect size; Instruments or protocols to be used; Validity, reliability, and triangulation of measures; Data analysis plans (Statistical Models, procedures for analysis of text/video/observation data)

2219 International Postdoctoral Research Fellowship Programme for Turkish Citizens

3.2. Management structure: Work Packages Table*

Provide a work-time schedule and success criteria. Base your account on the logical structure of the research and the stages in which it is to be carried out. The number of work packages should be proportionate to the scale and complexity of the research. You should give enough detail in each work package to justify the proposed resources to be allocated and also quantified information so that progress can be monitored by TÜBİTAK.

WP No	Work Package	Period (month-year)	Success Criteria (%, number, statement etc.)	Importance of the WP for success of the Research (%)**

(*)The rows and columns in the schedule can be enlarged and increased.
(**)The sum of percentages in the columns should be 100.
The success criterion describes the criteria for each WP to be considered successful. The criterion of success is indicated by quantitative or qualitative criteria (expression, number, percentage, etc.) to be measurable and monitorable.

3.3. Risk Management Table

Describe any critical risks, relating to research implementation, that the stated research's objectives may not be achieved. The risks that can affect the success of the research negatively and the alternative plan(s) (Plan-B) that will be implemented in case of encountering with those by regarding the related work packages should be described. Implementation of Plan B should not lead to deviation from the main objectives of the research.

WP No	Main Risks	Risk Management (Plan-B)

Researcher (Fellow) Signature	Host Signature