


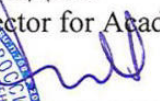
Министерство науки и высшего образования Российской Федерации
федеральное государственное автономное
образовательное учреждение высшего образования
«Национальный исследовательский Томский политехнический университет» (ТПУ)

APPROVED BY
Director of Power Engineering School


_____ A.S. Matveev
« » _____ 2022 г.

УТВЕРЖДАЮ
Vice Rector for Academic Affairs




_____ M.A. Solovov
_____ 2022 г.

Admissions Assessment Policies and Procedures
For master Program “Electric Power Generation and Transportation”
Field of Study 13.04.02 «Electric Power Engineering»
realized in English including a network form
together with the Czech Technical University of Prague, Czech Republic

Head of educational program
“Power Generation and Transportation”



Surkov M.A.

ANNOTATION

Field of Study 13.04.02 «Electric Power Engineering»

POWER ENGINEERING SCHOOL

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Admissions Assessment Policies and Procedures was developed at the standardized TPU exam and is intended for applicants entering the magistracy in the field of 13.04.02 «Electric Power Engineering» according to the master program "Electric Power Generation and Transportation», realizing in English and implemented jointly with the Czech Technical University (Prague).

The purpose of the entrance tests is to ensure inter-university and inter-program mobility of undergraduate graduates when moving to the second level of study, as well as determining the current level of English language proficiency.

GENERAL REQUIREMENTS FOR APPLICANTS

REGULATIONS AND PROCEDURES

Entrance test for applicants for training in the direction of master's degree 13.04.02 "Electric power and electrical engineering under the program" Electric Power Generation and Transportation / Production and transportation of electrical energy ", implemented in English, including the network form with the Czech Technical University Prague, conducted in the form of an oral interview. The interview with each applicant includes 4 questions - one randomly selected question from the sections of the program of the entrance test - "The content of the sections and topics of the program of the entrance test." To prepare for the entrance test (VI), the applicant can use the section "Recommendations for preparing for the entrance test".

The interview combines elements of the entrance test both orally (2 tasks on topics from the section "Contents of sections and topics of the program of the entrance test") and in writing (answers to questions on the ticket in writing, solving a practical problem, building dependencies and deriving formulas - 2 tasks on topics from the section "Contents of sections and topics of the program of entrance examination").

Answers written in legible handwriting or typewritten text using a computer are accepted. In the remote format of the interview, the answer is typed by text message to the program in which the interview is conducted, or from the e-mail specified by the applicants when registering for the VI or in the applicant's personal account, to the e-mail of the responsible person - a member of the examination committee.

An oral interview is conducted by the Examination Board with each of candidates individually. A candidate is interviewed with the questions which enable to evaluate the degree of the main engineering skills (general professional skills) development.

Not more than 30 minutes is allocated for each candidate's interview.

The final score of the entrance test is determined in accordance with the criteria presented in the section "ASSESSMENT CRITERIA".

An entrance test in the form of an oral interview is conducted by the examination committee and can be organized at special sites (in the classroom) or remotely. If necessary, the procedure for conducting an entrance test remotely is controlled by an observer.

On the day of the entrance test, the candidates are allowed into a university examination hall where the entrance tests will be held according to the list in which each candidate is assigned the time for an oral interview.

The procedure for conducting the entrance test in remote test setting is regulated by the active procedures and regulations validated by the rector's orders: The Procedures and Regulations of the Entrance Exams for TPU Master Degree Studies and the Procedures and Regulations for the Entrance Exams Conduct.

The examination committee has the right to ask 1-2 additional questions on the topics of sections of the VI program. At the end of the interview, the Protocol of the meeting of the examination committee (Appendix 1) is drawn up and the result is communicated to the applicant against his signature.

A candidate has a right of appeal the entrance tests results if a candidate, on stated grounds, considers that the mark assigned in the entrance test is erroneous and (or) if there is evidence of substantive irregularity in the conduct of the entrance test. Such appeals are dealt with in compliance with the Regulations for TPU Board of Appeal validated by the rector's order.

ASSESSMENT: MARKS AND DESCRIPTORS

Maximum mark for the entrance exam is 100.

Minimum mark*, sufficient for considering the entrance exam results as successfully passed is 56.

The total mark is determined as the sum of marks for answers provided by a candidate for each of the questions including candidate's answers to additional questions.

An answer provided by a candidate to each of the questions (4 main questions and 1-2 additional questions) is evaluated by the Examination Board separately according to the descriptors, below:

Oral part:

The maximum score for each oral question is 100. The answer to each of the questions is evaluated by the examination committee separately, taking into account the following criteria:

Mark Range	Descriptors
0-7	The answer has no valuable information, a candidate reveals absence of knowledge of the main concepts, is not able to relate theory to practice.
8-14	Partially relevant or not sufficiently comprehensive answer evidencing significant gaps in knowledge; formal answers by the book; evidence of not understanding the questions.
15-20	Sufficient knowledge revealed; sufficient comprehensive answer is provided. A candidate demonstrates ability to form his/her own judgement. There are insignificant gaps in knowledge presentation.
21-25	Comprehensive based on critical thinking answer generated by a candidate. The answer relates theory and practice and is supported by conclusions made by a candidate.

FOOTNOTE

** In case a candidate earns less than 56 marks for the entrance exams, a candidate is not allowed for enrollment competition as having not passed the entrance exams.*

Written part:

The maximum score for each written question is 100. The answer to each of the questions is evaluated by the examination committee separately, taking into account the following criteria:

Mark Range	Descriptors
0-7	The applicant presents the results of completing the tasks of the written part of the ticket, but: the results are incorrect or not presented in full - the wrong way of solving, the wrong answer, there is no analysis, no conclusions are drawn, no explanations.
8-14	The applicant completed the tasks of the ticket of the written part, but: the results of the tasks contain errors; not all the results obtained are supported by the conclusions; demonstrated the ability to analyze, but the results of the analysis contain inaccuracies and are not supported by explanations; there are no conclusions.
15-20	The applicant completed the tasks of the written part of the ticket: the answers are presented sequentially, however, they contain minor errors, and there are inaccuracies in the explanations, there are no conclusions.
21-25	The applicant correctly completed the tasks of the ticket of the written part and gave exhaustive explanations of the results obtained: the answers are presented sequentially, with explanations (derivation of formulas, description of the sequence of actions, etc.); the necessary analysis was carried out and conclusions were drawn.

CONTENT OF SECTIONS AND TOPICS OF THE ENTRANCE TEST PROGRAM

Specification 13.04.02 «Electric Power Engineering»

№	Module name
	<i>Electric Power Systems and Networks.</i>
1	Basic Terms and definitions. Classification of electrical networks
2	Structural elements of overhead power lines: power transmission pole, wires, insulators, pole fittings.
3	The equivalent circuit of overhead power lines. Determination of the equivalent circuit parameters.
4	Features of overhead electrical power lines with a phase-split.
5	Cable power lines: structural elements, structural design.
6	Double-winding and three-winding transformers: identification marking, structural elements, determination of the equivalent circuit parameters.
7	Autotransformers. Features of the windings connection. The concept of typical power.
8	Power losses in the elements of the electric network.
9	Power-time diagrams and their characteristics. Determination of power loads in steady-state modes calculations.
10	The calculation of the operating modes on the example of an overhead power line. Overhead power line operation at no-load mode. Phasor diagrams for an operating modes.
11	Calculation of the electric network operation mode with different rated voltages.
12	Voltage drop and Voltage loss.
13	The calculation of the operation mode for the ringed electric network. Homogeneous electric network. Calculation of the power flow distribution in double feed electric network.
14	Losses of electric energy and methods for their calculation. Loss reduction events.
15	The balance of active power and its relationship with frequency in electric network. Frequency control.
16	The balance of reactive power and its relation with voltage in electric network. Sources and consumers of reactive power.
17	Voltage control. Features of various PFC units as devices for voltage control. Voltage control by transformers. Principles of voltage control. Counterload voltage control.
18	The main per for mace indicators (technical and economic indicators) witch define in the construction of the electrical network. The criterion for choosing the best option when designing an electrical network.
19	Types of electric power substations. Equipment of electric power substations. Schemes for connecting substations to the electric network.
20	Main parameters selection in the design of the electrical network: rated voltage, wire size. Checking the selected size for technical restrictions.
№	Module name
	<i>Power supply</i>
1	Categories of power supply reliability.
2	Classification of workshop environments.
3	Conductors laying methods.
4	Block diagrams of electric networks.
5	Methods for calculating electrical loads.
6	Operating modes of current-using equipment.
7	Selection of air circuit breaker.
8	Fuse selection.
9	Conductor size selection.
10	Determination of the rated current for the current-using.
11	Types of neutral earthing systems in low voltage networks (below 1000V).
12	Power quality.
13	Power factor correction.
14	Energy efficiency of electric energy consumption.
15	Purpose of equipment.
16	Electrical Symbols.
17	Determination of the effective number of the current-using equipment.
18	Determination of the design capacity for a group of current-using equipment.
19	Charts of electrical loads.
20	Calculation of currents of a group of the current-using equipment.
№	Module name
	<i>Theoretical Foundations of Electrical Engineering</i>
1	Concepts of the electrical circuits theory.
2	Passive elements of electric circuits.
3	Concepts of the magnetic circuits theory.
4	The boundary conditions of the electromagnetic field.

5	The laws of the theory of electrical circuits.
6	The laws and equations of magnetic circuits.
7	The laws and equations of the electromagnetic field.
8	Analysis of Linear Resistive DC circuits.
9	Relation between voltage and current of bipolar linear passive elements.
10	Resonance.
11	Three phase circuits.
12	Power in electrical circuits.
13	Mutual inductance.
14	Non-sinusoidal periodic voltages and currents.
15	Parameters and equations for long lines.
16	Calculating methods for steady-state processes in linear resistive DC circuits.
17	Concepts and equations of steady- state processes in linear circuits with sinusoidal currents.
18	Relations for the calculation of transient processes in linear circuits.
19	Calculation of steady- state processes in nonlinear circuits.
20	Calculation of transient processes in nonlinear circuits.
№	Module name
	<i>Relay Protection</i>
1	Instrument transformers.
2	General principles of relay protection.
3	Directional and non-directional stepped current protection of lines with voltage triggering.
4	Line zero sequence stepped current protection.
5	Line distance protection.
6	Line carrier-current phase-differential protection.
7	Longitudinal and transverse differential protection of the generator stator winding
8	Generator protection from abnormal operating modes.
9	Generator stator winding earth fault protection.
10	Generator distance protection.
11	Generator negative sequence current protection.
12	Transformer differential protection.
13	Overcurrent protection with Voltage Blocking Element.
14	Transformer directional stepped current protection.
15	Transformer gas protection.
16	Busbar differential protection.
17	Synchronous and asynchronous motors protection.
18	Autoreclosing.
19	Automatic load transfer.
20	Connecting an alternator in parallel with.
№	Module name
	<i>Electric Power Stations and Substations</i>
1	Types and features of technology processes for various types power plants.
2	Cooling and excitation systems of synchronous generators and compensators. Automatic field breaking of alternator.
3	Operating modes of synchronous turbogenerators. Generator capability chart.
4	Power transformers: cooling systems, voltage control systems, operating modes, selection.
5	Types of neutral earthing systems in HV networks (over 1000V): features, application areas.
6	Switching substations: types, components, purpose of equipment, switching schemes. Substation switching schemes in uninterrupted duty mode and emergency mode.
7	Thermal and electrodynamic effect of short circuit currents. Terms of selection of electrical apparatus and conductors of short-circuit withstand strength, compliance with the temperature-rise.
8	Principles of operation, parameters, types, selection of current and voltage instrument transformers.
9	Processes when disconnecting an AC circuit breaker. Circuit breakers: types, application areas, features. Control and indicating circuits.
10	The structure of auxiliary power of substations and power plants. Working and emergency auxiliary power supply. Auxiliary switchgear switching schemes.
11	Conductors: types, basic structural elements, application areas, Terms of selection.
12	Design conditions for electrical apparatus and current-carrying parts selection.
13	Limiting electric devices: types, principles of operation, parameters, selection.

RECOMMENDATIONS

for exam preparation

- Discipline "Electric Power Systems and Networks"

Basic literature:

1. Поспелов Г.Е., Лычев П.В., Федин В.Т. Электрические системы и сети: Учебник. - Мн.: УП «Технопринт», 2004.-212 с.
2. Лыкин А.В. Электрические систем и сети: Учебное пособие. Новосибирск: Изд-во НГТУ, 2008. - 256 с.
3. Справочник по проектированию электроэнергетических систем. Под ред. Д.Л. Файбисовича. - М.: Изд-во НЦ ЭНАС, 2012. - 376 с.

Additional literature:

1. Правила устройства электроустановок. — Москва: КноРус, 2014. — 488 с. + CD- ROM. — Все действующие разделы шестого и седьмого изданий с изменениями и дополнениями по состоянию на 1 февраля 2014 г.. — ISBN 978-5-406-03513-9. — ISBN 978-5-406-03512-2.
2. Ананичева С.С., Калинкина М.А. Практические задачи электрических сетей: Учебное пособие / С.С. Ананичева, М.А. Калинкина.- Екатеринбург, из-во УРФУ, 2012,- 112 с.

- Discipline "Power supply"

Basic literature:

1. Сумарокова Л.П. Электроснабжение промышленных предприятий: Учебное пособие. - Томск: Изд-во ТПУ, 2012 - 288с.
2. А.А. Сивков, Д.Ю. Герасимов, А.С. Сайгаш. Основы электроснабжения / Учебное пособие - Томск: Изд-во Томского политехнического университета, 2012.-178с.
3. Кабышев А.В. Электроснабжение объектов. 41. Расчет электрических нагрузок, нагрев проводников и электрооборудования: Учебное пособие. - Томск: Изд-во ТПУ, 2007.-185 с.
4. А.А. Сивков, Д.Ю. Герасимов, А.С. Сайгаш. Основы электроснабжения: учебное пособие. Томский политехнический университет. - Томск: Изд-во Томского политехнического университета, 2012. -178с.
5. Гаврилин А.И., Обухов С.Г., А.И. Озга. Электроснабжение промышленных предприятий /Учебное пособие. - Томск: Изд-во ТПУ, 2013.-131 с.
6. Кудрин, Борис Иванович Электроснабжение [Электронный ресурс] : учебник в электронном формате / Б. И. Кудрин. — 2-е изд., перераб. и доп.— Мультимедиа ресурсы (10 директорий; 100 файлов; 740МВ). — Москва: Академия, 2012. — 1 Мультимедиа CD-ROM. — Высшее профессиональное образование. Бакалавриат—Энергетика. — Системные требования: Pentium 100 MHz, 16 Mb RAM, Windows 95/98/NT/2000, CDRом, SVGA, звуковая карта, Internet Explorer 5.0 и выше.. — ISBN 978-5-7695-9307-9.

Additional literature:

1. Липкин Б.Ю. Электроснабжение промышленных предприятий и установок. - М.: ВШ, 1990.
2. Федоров А.А., Каменева В.В. Основы электроснабжения промышленных предприятий. - М.: Энергоатомиздат, 1984. - 386 с.

3. Варченко Т.Н., Закиров Р.И. Электроснабжение промышленных предприятий /Учебное пособие к курсовому проекту. Томск: Изд-во ТПИ, 1988. - 96 с.
4. Справочник по электроснабжению и электрооборудованию. В 2 т./ Под ред. А.А. Федорова, т.1, т.2, - М.: Энергоатомиздат, 1986, 1987 гг.
5. Справочник по проектированию электроснабжения/ Под ред. В.И.Круповича, Ю.Г.Барыбина. - М: Энергия, 1980.-428 с.
6. Конюхова Е.А. Электроснабжение объектов. - М.: Мастерство, 2001. - 320 с.
7. А.М. Викторенко. Электротехнологические промышленные установки /Учебное пособие. - Томск: Изд-во ТПУ, 2004.
8. Мельников М.А. Внутрицеховое электроснабжение /Учебное пособие. - Томск: Изд-во ТПУ, 2002- 143 с.
9. Мельников М.А. Внутризаводское электроснабжение /Учебное пособие. - Томск: Изд-во ТПУ, 2002- 159 с.
10. Мельников М.А. Электроснабжение промышленных предприятий /Учебное пособие. - Томск: Изд-во ТПУ, 2001

- Discipline "Theoretical Foundations of Electrical Engineering"

Basic literature:

1. Бессонов Л.А. Теоретические основы электротехники. Электрические цепи. - М.: Высшая школа, 2012. - 701 с.
2. Демирчян К.С., Нейман Л.Р., Коровкин Н.В. Теоретические основы электротехники. Том 1. - СПб.: Питер, 2009. - 512 с.
3. Демирчян К.С., Нейман Л.Р., Коровкин Н.В. Теоретические основы электротехники. Том 2. - СПб.: Питер, 2009. - 432 с.
4. Демирчян К.С., Нейман Л.Р., Коровкин Н.В., Чечурин В.Л. Теоретические основы электротехники. Том 3. - СПб.: Питер, 2009. - 377 с.
5. Сметанина Р.Н., Носов Г.В., Исаев Ю.Н. Теоретические основы электротехники. Ч. 1. Постоянный и синусоидальный токи в линейных цепях: учебное пособие. -Томск: Изд-во Томского политехнического университета, 2009. - 118 с.

Additional literature:

1. Бессонов Л. А. Теоретические основы электротехники. Электромагнитное поле. М.: Высш, шк., 1985. - 263 с.

- Discipline "Relay Protection"

Basic literature:

1. Киреева Э.А. Релейная защита и автоматика электроэнергетических систем: учебник / Э. А. Киреева, С. А. Цырук. - Москва: Академия, 2014. - 287 с.
2. Дьяков А.Ф. Микропроцессорная автоматика и релейная защита электроэнергетических систем: учебное пособие / А.Ф. Дьяков, Н.И. Овчаренко. -М.: Издательский дом МЭИ, 2010. - 336 с.

3. Чернобровов Н.В., Семенов В.А. Релейная защита энергетических систем. Учебное пособие. М.: Энергоатомиздат, 1998 - 800 с .

Additional literature:

1. Дрозд, В.В. под ред. Релейная защита и автоматика в электрических сетях / В.В. под ред. Дрозд. — Москва: Энергия, 2012. — 632 с.. — Доступ только с авторизованных компьютеров. — Схема доступа: <http://ibooks.ru/reading.php?short=l&isbn=978-5-904098-21-6>
2. Релейная защита [Электронный ресурс] : учебное пособие / В. Н. Копьев; Национальный исследовательский Томский политехнический университет (ТПУ). — 1 компьютерный файл (pdf; 7.94 МВ). — Томск: Изд-во ТПУ, 2011. — Заглавие с титульного экрана. — Доступ из корпоративной сети ТПУ. — Схема доступа: <http://www.lib.tpu.ru/fulltext2/rn/2012/m355.pdf>

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THE REPORT
of the Examination Board meeting

the oral interview for _____

(code of specialisation, title of degree programme)

Date of the entrance exam _____ 2020

A candidate

Name, Patronymic (Second) Name, Family Name

The Examination Board members:

Name, Patronymic (Second) Name, Family Name	University Position
	the Examination Board Chair

The questions asked (entrance exam questions card number - _____):

#	Question	Marks
1.		
2.		
3.		
4.		
5.		
The Total Mark		

The Examination Board members' signatures:

Name, Patronymic (Second) Name, Family Name	Signature

With the oral interview results _____ (agree/ do not agree)

_____/_____
(signature) (Name, Patronymic (Second) Name, Family Name of a Candidate)