



SouthZEB WP3, D3.3

**Deliverable 3.3: SouthZEB
assessment exams**

February 2017

WP3-D3.3



Co-funded by the Intelligent Energy Europe
Programme of the European Union

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EXECUTIVE SUMMARY

The objective of this document is to present the procedure followed for the development of the assessment exams and indicative examples. These exams based on the 10 different training modules developed during the WP3 (Task 2 and 3). The assessment exams were a useful tool in order to assess the skills acquired by the trainees during the “train the trainer workshops” and the training sessions (WP5). In that way, the exams led to training certificates.

The present document is an output of WP3, Task 4 (D3.3).

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1. INTRODUCTION

The SouthZEB consortium developed ten different training modules during the WP3 (Task 2 and 3). The next step was the preparation of the assessment exams for each training module. The assessment exams were a useful tool in order to assess the skills acquired by the trainees during the “train the trainer workshops” and the training sessions (WP5). In that way, the exams led to training certificates.

The assessment exams are available as a set of multiple-choice questions that were selected by partners from each target country when the actual exams took place. The participants took a written exam for each module in order to be evaluated. For each training module, 100 multiple-choice questions have been prepared and for each actual exam 30 questions were selected. According to the Grant Agreement, 2-3 maximum errors were allowed. However, the SouthZEB consortium decided to determine a success threshold. More specifically, the success threshold for the trainers was 80% and for the trainees 60% accordingly.

Concerning the certifications awarded to participants, the participation in the “train the trainers” workshops (Wp5, Task 5.1) and the successful completion of a set of 4 specific workshops will lead to a “nZEB trainer” certificate. During each workshop, one training module will be delivered. In the same way, a “nZEB designer” certificate will be awarded to the trainees that successfully complete four training modules. Each target country would issue the certificates under a common layout, which will be the same for all target countries. The period of validity will be 5 years and it will include a reference number for the certificate, the number of the successful training modules attended and the country where the trainers and trainees will have attended the training modules. It is also noted that in case of failure in the exams, trainers and trainees could take the exam for each training module three (3) times maximum.

In the following sections, some indicative examples of the developed assessment exams of the training modules are presented.

2. ASSESSMENT EXAMS PROCEDURE

Assessment is an integral part of instruction, as it determines whether or not the goals of education are being met. KEK’s and BEST’s expertise in certified vocational training were used for this purpose. Each module will have to be assessed in a separate exam, while all exams will lead to training certificates. The fact that the training modules were developed based on existing successful programmes facilitated this procedure.

Assessment affects decisions about grades, placement, advancement, instructional needs, curriculum, and, in some cases, funding. For each of the training modules there were an initial and a final assessment for trainees run by National Partners. The questions were available in Greek, Italian, Portuguese and English.

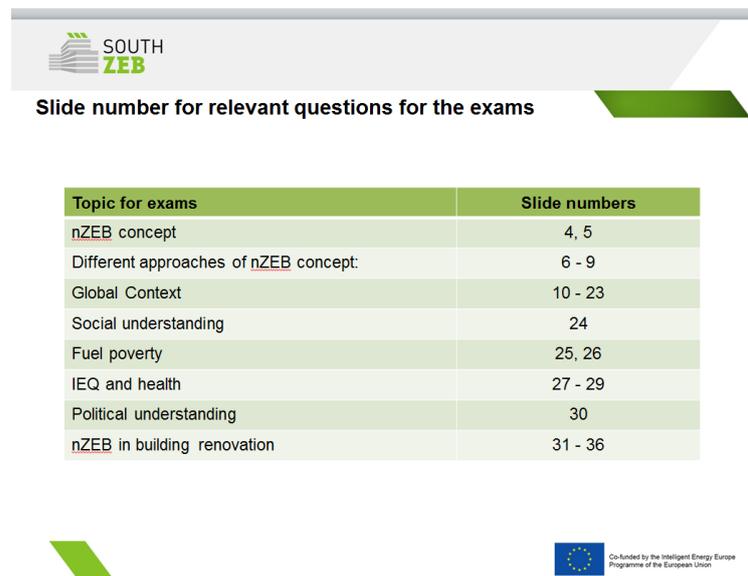
As mentioned above the assessment exams were based on the 10 training modules developed by the SouthZEB consortium. Table 1 presents the developed modules and the respective partner-leader.

Table 1: Developed modules and leaders

Module	Partner
1- nZEB Basic module	CUT
2- nZEB Advanced module	DTTN
3- Thermal bridging	BRE
4- Thermal comfort	UMinho
5- SouthZEB framework module and local architectural regulations	BRE
6- nZEB simulation and design softwares	IST-ID
7- Low carbon technology and automation for nZEB	BRE

8- Retrofitting towards nZEB	UMinho
9- Construction management and field supervision of nZEB	GARNET
10- Preparation of funding schemes and other incentives for nZEB	BRE

Partner responsible for each training module provided KEK (Leader of Task 4, WP3) with the relative material in order to prepare the assessment exams. Moreover, it was requested from partners-leaders who developed the training modules to propose the most important topics for the exams. For this reason, an extra slide was prepared as guidance. An example of this slide is appeared below for Module 8, session 1 (Fig. 1).



The slide features the SOUTH ZEB logo at the top left and the text "Slide number for relevant questions for the exams" in the center. Below this is a table with two columns: "Topic for exams" and "Slide numbers".

Topic for exams	Slide numbers
nZEB concept	4, 5
Different approaches of nZEB concept:	6 - 9
Global Context	10 - 23
Social understanding	24
Fuel poverty	25, 26
IEQ and health	27 - 29
Political understanding	30
nZEB in building renovation	31 - 36

At the bottom right of the slide, there is a small European Union flag and the text "Co-funded by the Intelligent Energy Europe Programme of the European Union".

Figure 1: Indicative slide with specific topics to be covered for the exams.

Moreover, the development of the assessment exams was based on the training essay plans. The learning objectives and outcomes of each training module were taken into consideration.

Specifically, the development of the assessment exams for the training modules covers the following topics:

Module 1: nZEB Basic module

- Definition of Near Zero Energy Buildings
- European Directives and National Legislation
- Basic physics of Buildings
- Building Envelope
- Thermal Losses Mechanisms
- Thermal Insulation
- HVAC Systems
- Building automation
- RES technologies and minimum requirements

Module 2: nZEB Advanced module

- nZEB design
- Bioclimatic design
- Passive systems for heating/cooling
- Green buildings materials
- Natural ventilation
- Passive solar systems
- Systems and techniques for natural lighting
- Renewable technologies resources
- Energy efficiency and renewable energy measures

Module 3: Thermal bridging

- Thermal Performance of Building Envelope
- U-values
- Thermal bridging
- Impacts of building fabric
- Fabric performance and ZEBs
- Commissioning of building fabric

Module 4: Thermal comfort

- Thermal Comfort Concept
- Impact of building fabric on thermal comfort and energy use
- Range of temperatures associated to thermal comfort and their impact on buildings energy performance
- Relationship of thermal comfort with human health, well-being and productivity
- Thermo-regulatory system
- Heat balance
- Factors influencing thermal comfort
- Local thermal comfort/discomfort
- Natural ventilation and thermal comfort
- Thermal comfort predictive models
- Thermal Comfort assessment procedures

Module 5: SouthZEB framework module and local architectural regulations

- Local architecture and nZEB
- Planning for nZEB – the obstacles, legislation and opportunities
- Building regulations – overview of country situation and specifics of energy regulations
- nZEB and EPBD requirements
- Country specific issues with regards to the design, construction and operation of nZEB
- Examples of nZEB

Module 6: nZEB simulation and design softwares

- Energy modeling

- nZEB modeling
- EnergyPlus simulation program

Module 7: Low carbon technology and automation for nZEB

- PV
- Wind turbine systems
- Solar thermal
- Energy Storage
- Cost Optimality
- Building energy management systems

Module 8: Retrofitting towards nZEB

- nZEB concept in building renovation
- nZEB renovation strategies
- Passive and active renovation solutions towards nZEB
- Integration of renewable energy systems
- Cost optimal methodology applied to the renovation of buildings
- Life cycle costs assessment
- Difference between cost optimal solutions and net zero energy solutions
- Cost optimal renovation solutions according to the local context

Module 9: Construction management and field supervision of nZEB

- Sustainable Construction Management in nZEB
- EPBD and RED directives
- National legislation, building codes, regulations and guidelines
- Building information modelling
- Construction Management and Field Supervision for the various building envelope
- Components
- MEP Systems
- Renewable Energy & Energy Storage
- Building Automation in nZEB

Module 10: Preparation of funding schemes and other incentives for nZEB

- History, drivers, legislation and potential impact of green investment / funding schemes and incentives
- Overview of a wide range of existing green investment / funding schemes and incentives
- Applicability of funding schemes and incentives for specific country / regional requirements

3. REVIEWS AND UPDATES

It is, also, noted that during the development of the assessment exams, partners informed the leader of this task about any changes applied in the training modules. In such cases, correction actions were performed and assessment exams were updated. After the preparation of the 1000 questions by KEK, all partners provided their comments, edited the questions or even proposed new questions instead of the existing ones.

The last step was the second review of the 1000 multiple-choice questions after the implementation of the workshops of all countries. The evaluation from the participants (both trainers and trainees) and the observers helped to improve, update and finalize the questions of all modules. The material of the 10 modules was also updated, so the revised questions conformed to the new updated training modules and the comments gathered during the training procedure. Partners again provided their comments regarding the revised questions in order to finalize the procedure of the assessment exams design.

4. CERTIFICATION PROCEDURE

Certificates were awarded to the participants that successfully concluded the training. The participants had to take written exams for the modules they concluded in order to be certified. The physical presence of the trainees was necessary for the certification procedure. Each exam contained 30 questions. The SouthZEB consortium decided to determine a success threshold. More specifically, the success threshold for the trainers was 80% and for the trainees 60% accordingly.

A “nZEB trainer” certificate was awarded to the trainers that participated in the “train the trainer workshops” and successfully completed a set at least of 4 specific training workshops. The first module (1 - nZEB Basic) and the second module (2- nZEB Advanced) were mandatory, so participants chose at least two more training modules.

In the same way, a special “nZEB designer” certificate was awarded to the trainees that successfully completed at least a set of 4 specific training modules. Again, training modules 1 and 2 were mandatory.

The scope of this training and certification framework included building and associated professionals in the target countries who have undertaken certain levels of training and satisfactorily completed the relevant course assessments. The framework refers to the development of a skills set related to near zero energy buildings.

5. CONCLUSIONS

The main objective of Task 4 of WP3 was the development of 1000 multiple-choice questions. For each one of the 10 training modules, 100 questions were prepared, updated and reviewed by partners.

These questions were available in Greek, Italian and Portuguese and there is a strong belief that they could be translated in any language after the completion of the project.

The developed assessment exams were of great importance and a useful tool to assess the skills acquired by the trainees.

Each module was assessed in a separate exam consisting 30 questions out of the total of 100 questions delivered for that module. Assessment exams led to training certificates. The successful completion of at least four training modules led to “nZEB trainer” certificate for the participants of the workshops. In the same way, a “nZEB designer” certificate was awarded to the trainees that successfully completed a set of at least 4 modules.

Below is presented an indicative sample of the developed assessment exams. The complete package of the assessment exams has been distributed to all SouthZEB partners.

6. EXAMPLES OF THE ASSESSMENT EXAMS – MODULE 1

1. Regarding to nZEB buildings, state which of the following statements is true:
 - a. is define as a building with nearly zero energy performance
 - b. zero energy is required for the building to be functional
 - c. the near zero or very low required energy for the building to function should be covered by renewably energy which is produced by the building or near the building
 - d. the near zero or very low required energy for the building to function should be covered by renewably energy which is provided by an independent provider

2. Which of the following is not correct regarding windows and shading systems of a building:
 - a. It is a necessity to limit thermal losses through draughts
 - b. Artificial light is beneficial to the occupants health
 - c. There might be restrictions to the desired light density entering the building
 - d. Direct visual contact to the external environment is desirable

3. What percentage of primary energy consumption is required to originate from RES in an nZEB building:
 - a. 10%
 - b. **25%**
 - c. 75%
 - d. 100%

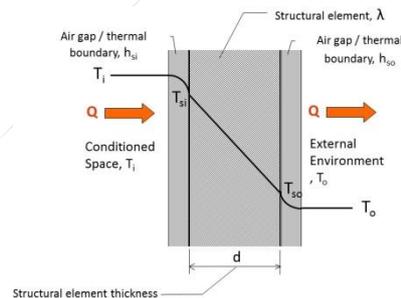
4. Why the use of nZEB is important?:
 - a. **Because it reduces total energy demand and CO2 as well as it secures energy supply and prices in the future**
 - b. Because it reduces total energy demand and oil consumption both in buildings and residential buildings
 - c. Because it reduces electrical appliance energy use that it is prudent to conserve energy
 - d. Because it determines the price of a property on the market

5. The EPBD can be applied to:
 - a. **New and existing buildings that are subject to renovation, building elements that have a significant impact on building's energy performance when they are retrofitted or replaced as well as technical building systems whenever they are installed, replaced or upgraded.**
 - b. Only to new buildings as they do not need any kind of renovation.
 - c. Only to existing buildings that are subject to renovation
 - d. Only to building elements and systems that have a significant impact on building's energy performance when they are retrofitted or replaced

6. What kind of inspections are required for the application of the recast EPBD:
- Inspections of electrical systems in buildings
 - Inspection of heating and air conditioning systems in buildings**
 - Inspections of lift systems in buildings
 - Inspections of A/C systems in buildings
7. The Energy Performance Certification (EPC) of buildings is assessed based on the corresponding national methodology. A valid EPC is required for:
- New buildings only
 - Old buildings only that are subject to renovation
 - Only for buildings that are used for commercial purposes
 - All the above**
8. Which of the following elements suffer the minimum thermal losses during winter season in a building:
- Floor
 - Air-tight windows
 - Insulated walls**
 - Rooftop

9. Determine the thermal losses (Q) of the structural element, according to the figure below:

- $Q = \frac{\lambda}{d} A(T_i - T_o)$
- $Q = h_{so} A(T_{si} - T_{so})$
- $Q = \frac{\lambda}{d} A(T_{si} - T_{so})$
- $Q = UA(T_{si} - T_{so})$



10. Thermal Gains through the roof occur:
- At dawn, due to solar radiation
 - At sunrise, due to solar radiation
 - At noon, due to solar radiation
 - In sunny days, due to solar radiation

7. EXAMPLES OF THE ASSESSMENT EXAMS – MODULE 2

1. A Building Envelope is defined as:
 - a. **Every element of the building that connects the building's conditioned spaces with the external environment**
 - b. Every element of the building that connects the building's unconditioned spaces with the external environment
 - c. Every element of the building that connects the building's conditioned spaces with the internal environment.
 - d. Every element of the building that connects the building's unconditioned spaces with the internal environment.

2. Indicate which of the following is considered to be a vertical structural building element:
 - a. **Walls and columns**
 - b. Rooftops and floors
 - c. Doors and windows
 - d. Shading systems

3. An insulating material is considered to be:
 - a. Any material that limits heat transfer from an environment of low temperature to an environment of higher temperature
 - b. Any material that limits heat transfer from an environment of high humidity to an environment of lower humidity.
 - c. **Any material that limits heat transfer (primarily by conduction) from an environment of high temperature to an environment of lower temperature**
 - d. Any material that limits heat transfer from an environment of low humidity to an environment of higher humidity

4. Which of the following insulation materials is a combined one :
 - a. Fibrous.
 - b. **Gypsum foam**
 - c. Foamy
 - d. Foamy expanded

5. Main thermal property for insulating material classification is the thermal conductivity (k or λ). As a rule of thumb, any material with a thermal conductivitycan be classified as an insulating material:
 - a. **$k \leq 0.1$ W/mK**
 - b. $k \geq 0.1$ W/mK
 - c. $k \leq 0.2$ W/mK
 - d. $k \geq 0.2$ W/mK

6. State which of the following statements is false:
 - a. HVAC is the technology of indoor and vehicular environment comfort. Its goal is to provide thermal comfort and acceptable indoor air quality.

- b. HVAC is important in the design of medium to large industrial and office buildings as well as in marine environments, where safe and healthy building conditions are regulated with respect to temperature and humidity, using fresh air from outdoors
 - c. Most common HVAC system circulates air through or around heating and cooling devices. A fan forces air into ducts. Supply ducts transport conditioned air into building through diffusers or supply registers.
 - d. **HVAC system design is a sub-discipline of mechanical engineering, based on the principles of thermodynamics, fluid dynamics, and internal energy**
7. Which of the following is not an HVAC application:
- a. Thermal storage - isolation of storage tank
 - b. Heating portable hot water (instantaneous heater)
 - c. **Insulation optimization**
 - d. Waste heat recovery from condenser water
8. Which of the following is not an HVAC component:
- a. Furnace
 - b. **Electrical resistance**
 - c. Evaporator coils
 - d. Condensing unit
9. Which of the following is not a principle against heat loss during winter:
- a. Double skin facade
 - b. **Interior shading devices**
 - c. Air tightness
 - d. Glazing
10. A Passive House is a comprehensive system. Which of the following is not valid:
- a. Any remaining heat demand is provided by an extremely small source
 - b. **Avoidance of heat loss through shading and window orientation also helps to limit the cooling load, which is similarly minimized**
 - c. An energy recovery ventilator provides a constant, balanced fresh air supply
 - d. It is a very well-insulated, virtually air-tight building that is primarily heated by passive solar gain and by internal gains from people, electrical equipment, etc.

8. EXAMPLES OF THE ASSESSMENT EXAMS – MODULE 3

1. Thermal bridges could be created in:
 - a. Windows of a building
 - b. Columns of a building
 - c. Doors of a building
 - d. **All the above**

2. Optimum design of building fabric:
 - a. Can minimize potential heating and cooling requirements
 - b. Can downsize heating and cooling systems
 - c. Can eliminate the need for heating and cooling systems
 - d. **All of the above**

3. When is the best time for the upgrade of building's fabric:
 - a. **During major refurbishment**
 - b. During minor renovation
 - c. During sunny days
 - d. During cold days

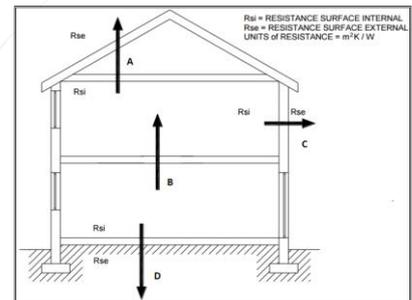
4. Simply by building and refurbishing our buildings to much higher insulation and airtightness standards could lead to at least an:
 - a. 80% reduction in cooling demand
 - b. **80% reduction in space heating demand**
 - c. 80% reduction in both heating and cooling demand
 - d. None of the above

5. The U-value is a measure of how effective a is in restricting heat loss:
 - a. **Building element**
 - b. Heating system
 - c. Cooling system
 - d. Ventilation system

6. U-value can be defined as:
 - a. **A measurement of how effective a building element such as wall, roof etc. is in restricting heat loss**
 - b. A measurement of how effective a building element is in consuming electrical energy
 - c. A measurement of how effective a building element is in absorbing solar heat
 - d. All of the above

7. Circle the material with the highest thermal resistance:
 - a. Polyurethane
 - b. **Cement**

- c. Aerogel
 - d. Extruded polystyrene
8. Thermal resistance is defined as the difference at state between two defined surfaces of a material construction that induces a unit heat flow rate through a unit area :
- a. **temperature, steady**
 - b. pressure, steady
 - c. temperature, unstable
 - d. pressure, unstable
9. Thermal resistance is proportional to its:
- a. Density of the material
 - b. Mass of the material
 - c. **Thickness of the material**
 - d. Temperature of the material
10. According to Table of EN ISO:6946:2007 (Building Components and Building Elements - Thermal Resistance and Thermal Transmittance - Calculation Method), from the figure below indicate the point(s) with the highest internal Surface Resistance (R_{si}):



- a. A
- b. B
- c. C
- d. **D**

9. EXAMPLES OF THE ASSESSMENT EXAMS – MODULE 4

1. The definition of thermal comfort is:
 - a. **The condition of mind that expresses satisfaction with the thermal environment and is assessed by subjective evaluation when the minimum energy of the human system is consumed**
 - b. The condition of mind that expresses satisfaction with the thermal environment and is assessed by subjective evaluation when the maximum energy of the human system is consumed
 - c. When the human system is unable to emit the excess of produced heat
 - d. When the temperature of human body cannot remain stable

1. Which of the following is not considered to be a basic factor influencing thermal comfort:
 - a. Air temperature
 - b. Radiant temperature
 - c. Metabolic heat
 - d. **Density**

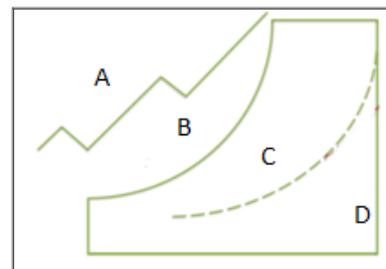
2. Climate change is correlated to:
 - a. Ambient temperature
 - b. Carbon dioxide concentration
 - c. Sea temperature
 - d. **All of the above**

3. Subjective parameters of thermal comfort are:
 - a. Change over timeline
 - b. Variable for each region separately
 - c. **Stable over timeline**
 - d. Variable over period of time

4. Which of the following factors is not affecting thermal sensation:
 - a. Air temperature
 - b. **Air pressure**
 - c. Humidity
 - d. Metabolic rate

5. Operative temperature is the:
 - a. **The uniform temperature of a radially black enclosure in which occupant would exchange the same amount of heat by radiation plus convection**

- b. Air temperature
 - c. Mean radiant temperature
 - d. Global temperature
6. Infiltration is minimized to:
- a. **Increase thermal comfort**
 - b. Increase energy consumption
 - c. Increase dust
 - d. All of the above
7. Wet bulb temperature is:
- a. The temperature of air measured by a thermometer freely exposed to the air but shielded from radiation and moisture
 - b. **A parcel of air would have if it were cooled to saturation (100% relative humidity) by the evaporation of water into it**
 - c. The temperature at which the water vapor in a sample of air at constant barometric pressure condenses into liquid water at the same rate at which it evaporates
 - d. The temperature of air measured by a thermometer freely exposed to the air, radiation and moisture
8. Enthalpy (h) does not depend on:
- a. Volume
 - b. Pressure
 - c. Internal energy
 - d. **Temperature**
9. Which line of the psychrometric chart is the specific enthalpy one:
- a. **A**
 - b. B
 - c. C
 - d. D.



10. EXAMPLES OF THE ASSESSMENT EXAMS – MODULE 5

2. Identify which of the following the Construction Products Regulation 2011 (CPR) is not intended to harmonize:
 - a. Methods of assessment and test
 - b. Means of declaration of product performance
 - c. System of conformity assessment of construction products
 - d. National building regulations

2. Identify the wrong phrase regarding CE marking of products under the Construction Products Regulation (CPR):
 - a. **CE marking enables a product to be placed legally on the market so as to be suitable for all end uses in all Member States**
 - b. CE marking indicates that a product is consistent with its Declaration of Performance (DoP) as made by the manufacturer
 - c. The declaration varies according to the particular harmonized technical specification covering the product
 - d. None of the above

3. In reference to the five systems of AVCP (Assessment and Verification of Constancy of Performance) and the level of involvement of the notified bodies, determine what "System 1+" includes:
 - a. **Product certification comprising the issuing of a certificate of constancy of performance with determination of the product-type, continuous surveillance and audit testing by a notified product certification body**
 - b. Product certification comprising the issuing of a constancy of performance with determination of the product-type and continuous surveillance by a notified product certification body
 - c. Factory production control certification with continuous surveillance by a notified factory production control certification body
 - d. Determination of product type by a notified testing laboratory

4. What type of notified body is required to undertake an initial inspection of the Factory production control (fpc) system in System 2+ type of AVCP (Assessment and Verification of Constancy of Performance):
 - a. Production certification body
 - b. **Factory production control certification body**
 - c. Test Laboratory
 - d. No independent involvement

5. For which systems of AVCP (Assessment and Verification of Constancy of Performance) the manufacturer is required to have a fully documented Factory production control (fpc) system:
 - a. Systems 1+ and 1 only
 - b. System 2+ only
 - c. Systems 3 and 4 only

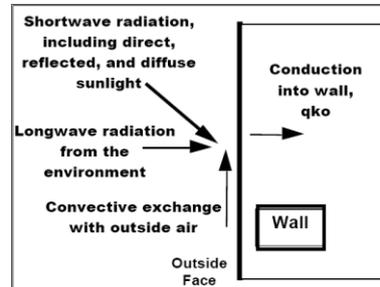
d. All 5 Systems

6. According to the Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings, the buildings account for of total energy consumption in the Union:
- 30%
 - 40%**
 - 50%
 - 60%
7. According to the Directive 2010/31/EU on the energy performance of buildings (Article 6), Member States must not take into account which of the following technical, environmental and economic feasibility of high efficiency alternative systems, before construction of new buildings starts:
- Cogeneration
 - Heat Pumps
 - Centralized energy supply systems based on energy from renewable resources**
 - District or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources
3. State which of the following statements is false, regarding Energy Performance of Buildings Directive
- European Union must reduce its energy dependency and greenhouse gas emissions
 - Requires Member States to review their energy standards in building regulations at intervals of not less than 2 years
 - Reduce energy consumption per building is reduced, increase proportion of energy from renewable sources
 - Buildings account for 40% of total energy consumption in the European Union
4. Recast EPBD, which of the following is true
- The definition of very low energy building was agreed to: "nearly zero" energy building means a building that has a very high energy performance
 - There is no specific target be set for the renovation of existing building, but Member States shall develop policies and take measures about it
 - MS will be required to introduce penalties for non-compliance
 - All the above
5. According to the 1st article of 2010/31/EE EPBD which of the statements below is correct?
- Building elements that form part of the building envelope and that have a significant impact on the energy performance of the building envelope when they are retrofitted
 - Sets minimum requirements, MS can exceed
 - Regular inspection of heating and air-conditioning systems in buildings
 - All the above

11. EXAMPLES OF THE ASSESSMENT EXAMS – MODULE 6

1. The heat balance on the outside face is:

- $q''_{\text{asol}} + q''_{\text{LWR}} + q''_{\text{conv}} - q''_{\text{ko}} = 0$
- $q''_{\text{asol}} + q''_{\text{LWR}} + q''_{\text{conv}} + q''_{\text{ko}} = 0$
- $q''_{\text{asol}} - q''_{\text{LWR}} + q''_{\text{conv}} - q''_{\text{ko}} = 0$
- $q''_{\text{asol}} - q''_{\text{LWR}} - q''_{\text{conv}} + q''_{\text{ko}} = 0$



2. In which of the following situations is not advisable to add more than two zones :

- Exposed thermal mass difference
- Client interest in predicting the thermal behaviour of a certain zone
- Stable internal load**
- Quite different solar gains (North/South, shading differences)

3. Which countries have an increasing number of Low Energy Homes (LEH) developments in the last two decades:

- France and Germany
- US and Germany**
- Spain and France
- US and Spain

4. In simulation, which of the following is not required:

- Space gains
- Surface construction elements
- Location - climate
- Electrical energy consumption**

5. Regarding the INPUT files of EnergyPlus simulation program, what does "In.epw" stands for:

- Climate file**
- Initialization File
- File with the results of the simulation
- File with messages

6. In EnergyPlus simulation program, the simple Surface Convection Algorithm: Outside depends on:

- The wind speed and surface roughness including radiative effect**
- The wind speed and surface roughness excluding radiative effect
- The wind speed only including radiative effect
- The roughness of the surface wind speed

7. In EnergyPlus simulation program, determine which of the following is not a simulation parameter:

- a. Shadowing calculations
 - b. Surface Convection Algorithm: Inside
 - c. Heat balance algorithm
 - d. **Building surface: detailed**
8. A "construction" is a sequential grouping of materials. Determine which of the following is invalid:
- a. Outside layer is the outermost layer of the outer element
 - b. In standard mode each construction can have 10 layers
 - c. **An opaque construction can contain glazing materials**
 - d. None of the above
9. In Zone Controls and thermostats, indicate how many humidistat and thermostat we can define for one zone:
- a. **1**
 - b. 2
 - c. 3
 - d. 4
10. EnergyPlus is:
- a. A user interface
 - b. Currently a life cycle cost analysis tool
 - c. An architect or design engineer replacement
 - d. **An energy analysis and thermal load simulation program**

12. EXAMPLES OF THE ASSESSMENT EXAMS – MODULE 7

1. What is nZeb?
 - e. A building with zero energy consumption
 - f. A building with near zero energy consumption**
 - g. A building with high energy consumption
 - h. A building with costly energy consumption

2. What kind of energy consumption is required for an nZEB?
 - e. Renewable energy**
 - f. Energy from Oil burning
 - g. Natural gas
 - h. Lignite energy

3. Which of the following is not considered to be a strategy that can help achieve nZEB:
 - a. Load reduction - via passive design
 - b. Regenerative systems - use waste energy
 - c. System efficiency - meet remaining loads as efficiently as possible
 - d. Ecological materials**

4. In site analysis of nZEB energy strategy, which of the following opportunities and constraints is not correct:
 - a. Site layout and shape
 - b. Location of building**
 - c. Ground conditions
 - d. Wind resources

5. In site analysis of nZEB energy strategy, solar access refers to:
 - a. Visible sky angles / neighboring buildings**
 - b. Dimensions of the windows
 - c. Shelter / trees
 - d. Natural ventilation

6. Determine the technology with low carbon dioxide savings:
 - a. CHP (Combined heat and power) filled by biomass
 - b. CHP (Combined heat and power) filled by gas
 - c. Photovoltaics (PVs)**
 - d. District heating and cooling

7. Indicate which of the following is not a low carbon emitting renewable technology:
 - a. Photovoltaics (PV)
 - b. Solar thermal
 - c. Small scale wind turbine
 - d. Oil boiler**

8. The main source of energy used in buildings of South European climate is:
- Electricity**
 - Solar
 - Hydroelectric
 - Wind
9. Which of the following is the most popular and favoured of all renewable technologies for venture capital and private equity investment:
- Small hydro
 - PV**
 - Geothermal
 - Wind
10. In a photovoltaic plant which is located in the South hemisphere, which are the 1) optimal pitch and 2) optimal orientation:
- 1 = the degrees of the latitude of the installation place, 2 = South**
 - 1 = the degrees of the latitude of the installation place, 2 = East
 - 1 = 25°, 2 = South
 - 1 = 25°, 2 = East

13. EXAMPLES OF THE ASSESSMENT EXAMS – MODULE 8

1. Energy performance of a building (EPBD) means the:
 - e. Highest calculated amount of energy needed for heating, cooling, ventilation, hot water and lighting of a building
 - f. **Measured or calculated amount of energy needed for a typical use of the building which includes amongst others heating, cooling, ventilation, hot water and lighting**
 - g. Produced amount of renewable energy needed for a typical use of the building which includes amongst others heating, cooling, ventilation, hot water and lighting
 - h. Highest calculated amount of energy needed for minimum use of heating, cooling, ventilation, hot water and lighting of a building

2. Regarding renewable energy supply options as part of different approaches of nZEB concept, which of the following is considered to be an example for purchase off-site:
 - a. **Utility based PV and wind farms**
 - b. Solar thermal system for hot water
 - c. Biomass imported from off site
 - d. All of the above

3. Under the Energy Performance of Buildings Directive what actions should be performed from EU countries?:
 - a. EU countries make energy efficient renovations to at least 3% of buildings owned and occupied by central government
 - b. EU countries must draw-up long term national building renovation strategies which can be included in their national energy efficiency action plans
 - c. **EU countries must establish inspection systems schemes for heating and air conditioning systems or put in place measures with equivalent effect**
 - d. All of the above

4. What is nZeb:
 - a. A building with zero energy consumption
 - b. **A building with near zero energy consumption**
 - c. A building with high energy consumption
 - d. A building with costly energy consumption

5. Due to the fact that there is not a common definition regarding the concept "Fuel Poverty", different approaches have been also considered. Which of the following definition does not refer to the above mentioned concept:
 - a. Anyone who meets in its housing particular difficulties to have the necessary energy to meet its basic energy needs because of the inadequacy of its resources or of its housing conditions is considered to be in fuel poverty
 - b. Fuel poverty has been described as the inability to afford adequate warmth in a home, or the inability to achieve adequate warmth because of the energy efficiency of the home
 - c. **The lack of access to basic energy services such as electricity, heat or other forms of power, where the well being of a large number of people in developing countries is negatively affected by very low consumption of energy**

- d. None of the above
6. Which is the main factor that causes energy poverty:
- Low energy efficiency of the building**
 - Low household income
 - High energy costs
 - Under occupancy of the home
7. Why the use of nZeb is so important:
- Because it reduces total energy demand and CO2 as well as it secures energy supply and prices in the future**
 - Because it reduces oil consumption both in buildings and residential buildings
 - Because it reduces electrical appliance energy use that it is prudent to conserve energy
 - Because it determines the price of a property on the market
8. According to Energy Efficiency Directive 2012/27/EU which buildings should be prioritized for energy performance measures:
- Residential buildings with the poorest energy performance
 - Government buildings with the poorest energy performance**
 - Both government and residential buildings with the poorest energy performance
 - Both government and residential buildings with the low energy performance
9. According to Energy Efficiency Directive 2012/27/EU which is the reason why Member States shall ensure that central government purchase only products, services and buildings with high energy-efficiency performance:
- It is consistent with sufficient competition
 - It is consistent with economical feasibility
 - It is consistent with technical suitability
 - All of the above**
10. Which of the following factors do not contribute to fuel poverty:
- Low household income
 - Poor energy efficiency of the property
 - Fuel price
 - High efficiency appliances**

14. EXAMPLES OF THE ASSESSMENT EXAMS – MODULE 9

1. What is BIM (Building Information Modeling):
 - a. A 3D Model
 - b. A database
 - c. A process
 - d. **All the above**

2. As far as BIM (Building Information Modeling) is concerned, which of the following phrases is not valid:
 - a. BIM helps people to construct
 - b. BIM is not 3D CAD
 - c. BIM programs are design applications in which the documentation flows from and is a derivative of the process, from schematic design to construction to facility management
 - d. **Objects in CAD can link to, receive or export attributes – can't do that with BIM**

3. From a contractor perspective, the implementation of BIM on the execution process/initiation of a project means:
 - a. Project visualization
 - b. **Time schedule**
 - c. BOQ (Bill of Quantities) and tender package
 - d. Coordination between design disciplines

4. From the list below identify the element which the energy model, though BIM, does not integrate in order to set the most appropriate HVAC system:
 - a. Ventilation
 - b. Indoor climatic conditions
 - c. **PV system**
 - d. Position and orientation of building

5. During the design phase, identify the task which can benefit from the incorporation of BIM:
 - a. 3D control and planning
 - b. **Energy analysis**
 - c. Construction system design
 - d. Space management and tracking

6. Building Envelope can be defined as the:
 - a. **Part of the building that makes a thermal barrier between interior of the building and exterior**
 - b. Part of the building that makes an air barrier between interior of the building and exterior
 - c. Part of the building which keeps the interior temperature stable
 - d. Part of the building between two floors

7. As far as air ducts in heat pump systems is concerned, from the list below identify the check/measurement that is not included in the commissioning phase:
- Air flow rate measurement
 - Measurements of air humidity
 - Ductwork leakage
 - Mechanical load test
8. Closed Control Loop ...:
- Does not incorporate feedback to make a correction
 - Is a basic control loop with a sensor a controller, and controlled device interacting to control a medium
 - Uses a measured signal, feeds the signal back and compares it to a set point, calculates and sends a return signal to make a correction
 - Is a control system in which the control action is totally independent of output of the system
9. Bus can be defined as the:
- Functional or physical unit as a defined interconnection between a device/system to another device/system or a person
 - A device that is pre-programmed to accept relay ladder logic instructions and perform these instructions to control the equipment operation
 - Communication medium and method between two or more devices with interface for serial data
 - Software that gathers data from devices through a communications channel
10. In an nZEB building, Building Automation can:
- Increase grid stability
 - Ensure that the whole system can work with highest efficiency
 - Increase the coverage rates of by renewable energy on site (PV)
 - All of the above

15. EXAMPLES OF THE ASSESSMENT EXAMS – MODULE 10

1. By 2020, the EU aims to:
 - a. Reduce its greenhouse gas emissions by at least 40%
 - b. Increase the share of renewable energy to at least 40%
 - c. **Achieve energy savings of 20% or more**
 - d. All of the above

2. The EU committed itself to the reduction of its Greenhouse Gas (GHG) emissions by between by 2050:
 - a. **80% - 95%**
 - b. 65% - 80%
 - c. 60% - 75%
 - d. 50% - 65%

3. Which of the following is considered to be an inherent co-benefit of energy-savings:
 - a. Saving money
 - b. Creating jobs
 - c. Improving competitiveness
 - d. **Improvement of energy security**

4. Better construction and use of buildings in the EU would influence:
 - a. A 50% of final energy consumption
 - b. Up to 40% of water consumption
 - c. **More than 50% of all extracted material**
 - d. All of the above

5. Which sectors represent a substantial energy-saving potential:
 - a. Buildings and industrial process
 - b. **Buildings and transport**
 - c. Agriculture and transport
 - d. Agriculture and buildings

6. account for over 45% of UK carbon emissions:
 - a. Industrial process
 - b. Transport
 - c. **Domestic and non domestic buildings**
 - d. Agriculture

7. Which term is used to cover a wide variety of contracting and financing techniques for energy efficiency and renewable energy projects:
 - a. Third Party Financing (TPF)

- b. Energy Performance Contracting (EnPC)
 - c. Contract Energy Management (CEM)
 - d. **All of the above**
8. The aim of the Carbon Emission Reduction Target (CERT) in the UK was to:
- a. Boost the number of heat and electricity microgeneration installations in the United Kingdom
 - b. To help cut carbon emissions
 - c. To reduce fuel poverty
 - d. **All of the above**
9. The Carbon Emissions Reduction Target (CERT) was an obligation on large UK energy companies to deliver energy saving measures to:
- a. **Households in receipt of certain income-related benefits or tax credits**
 - b. High income households
 - c. Any kind of household despite the amount of income earned
 - d. Households with single-occupant in rural geographical areas
10. As part of the UK's Carbon Emissions Reduction Target (CERT), a whole-house approach means:
- a. **Installing as many energy efficiency improvement measures as possible and appropriate within a home in a single decision making**
 - b. Installing as many energy efficiency improvement measures as possible and appropriate within a home in a series of decisions
 - c. Installing solely insulation improvement measures within a home in a single decision making
 - d. Installing solely insulation improvement measures within a home in a series of decisions