Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	GREEN BUILDING TECHNOLOGY
COURSE CODE	:	BNA 41003
PROGRAMME CODE	:	BNA
EXAMINATION DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **TEN (10)** PAGES

PART A: Answer **ALL** questions.

Q1 Forty percent of new buildings in Malaysia are being designed and constructed with various degrees of eco-friendliness to meet the green building concepts.

(a) Green buildings are built by using whole-building or integrated design concept to achieve energy, economic and environmental performance through it life-cycle. List **THREE (3)** elements of the integrated design concept in green building technology.

(3 marks)

(b) Green building become a global drive in construction industry worldwide by various national governments and international entities. Explain **FIVE (5)** motives on their great interest on the green building.

(5 marks)

(c) Green buildings have begun to attract tenants, investors and occupants which is more knowledgeable to the environmental and social impacts of the built environment. Thus, the demand for rent and sales is increasing due to the building's asset value. Discover the building's asset value which has different meanings to the various stakeholders such as developer, tenant and owner.

(6 marks)

(d) The built environment has a vast impact on the natural environment, human health and the economy. By adopting green building strategies, we can maximize both economic and environmental performance. Analyze the benefits of green building prior to the:

(i) Environment
(ii) Social
(iii) Economic

(6 marks)

Q2 (a) Green Building Index (GBI) is Malaysia's recognized assessment system for green buildings which administrate by Greenbuildingindex Sdn Bhd. The organization of the GBI for certification and accreditation of green-rated buildings consist of three tiers. Illustrate the organization of GBI accreditation panel and their roles.

(3 marks)

(b) In Budget 2014, the Government announced new Investment Tax Allowance (ITA) which result in publishing of a new gazette that valid until 31 December 2020. Discover **THREE (3)** objectives of the provided ITA.

(3 marks)

(c) The objective of energy efficiency criteria in GBI is to reduce energy consumption in buildings, thus reducing CO_2 emission to the atmosphere. In order to receive any GBI certification, implementation of minimum energy efficiency performance criteria is mandatory. Distinguish **THREE (3)** approaches to achieve this criteria.

(6 marks)

(d) With the fast development of the global economy, depletion of water resources is becoming an environmental issue of the utmost concern worldwide. Therefore, water conservation technologies and strategies are important aspects of a whole-building design strategy. Evaluate **FOUR (4)** corresponding signatories required to fulfill the water efficiency criteria in GBI.

(8 marks)

Q3 (a) Consumption of natural resources for building materials production in implementing construction works has a direct impact on natural bio-diversity due to the fragmentation of natural areas and ecosystems caused by the construction activities. Therefore, explain **TWO (2)** intentions of material and resources criteria in GBI.

(2 marks)

(b) Indoor air quality in GBI refers to the air quality within and around buildings and structures, especially as it relates to the health and comfort of building occupants. Understanding and controlling common pollutants indoors can help reduce your risk of indoor health concerns. Prepare **FOUR (4)** features or materials used to be implement for this purpose.

(4 marks)

(c) Investigate **THREE (3)** approaches in choosing appropriate site to avoid development of inappropriate sites and reducing the environmental impact from the location of a building as stated in GBI.

(6 marks)

(d) Sketch and design a residential house layout towards green building and sustainability. In your sketches, label and explain minimum **FOUR (4)** elements or features affected on economics and natural environment.

(8 marks)

PART B

Q4 Answer **ALL** questions. Answers have to be marked on OMR sheet.

1. What is the best definition of high-performance buildings?
   High performance buildings…

   A. are efficient, healthy, and environmentally responsible.
   B. use efficient materials sourced from all over the world.
   C. provide a low-energy building no matter the cost.
   D. improve the health of the occupants but not the workers.

2. Most people incorrectly believe that high-performance buildings cost more to design and build than conventional buildings. However, what could actually add significant first costs to a green project?

   A. Installing solar panels
   B. Designing the envelope to have south facing windows
   C. Taking advantage of daylight
   D. Providing information about the building's mechanical systems to the building's operators

3. Current market trends show the construction industry moving towards:

   A. high-performance buildings
   B. traditionally constructed buildings
   C. high-rise buildings
   D. buildings with less mechanical ventilation

4. What is the best definition of a green job?

   A. A career in the roofing industry.
   B. A career with an architecture firm that focuses on retrofitting buildings.
   C. A career in development of environmental policy.
   D. A career-track job that helps enhance or preserve environmental quality.

5. Jobs in the energy efficiency industry include:

   A. Installation of smart lighting
   B. Sealing duct leaks in HVAC systems
   C. Insulating walls and ceilings
   D. All of the above

6. What do you think uses the most household water?

   A. Car washing
   B. Dish washing
   C. Showers and baths
   D. Toilet flushing

7. What are greenhouse gases?

   A. Gases such as CO2 and methane in the atmosphere that trap the sun's heat.
   B. Gases in the atmosphere such as nitrogen, that allow heat to escape.
   C. O3, which makes up the ozone layer.
   D. Gases, which are created by sunlight hitting the ocean, keep the planet warm.

8. Weather is the everyday state of the atmosphere, and climate is the average weather pattern of one place over a period of time.

   A. True
   B. False

9. Climate change refers to:

   A. The increase in Earth's temperature over millions of years.
   B. The increase in greenhouse gases in earth's atmosphere.
   C. The increased use of hydrofluorocarbons causing a hole in the ozone layer.
   D. Long-term changes in earth's climate system resulting in new weather patterns.

10. What is an environmental benefit of constructing a high-performance building?

    A. More locally sourced materials mean fewer emissions from transportation.
    B. An increase in availability of office space, increasing the density of the area.
    C. Better air quality surrounding the building due to off-site solar energy.
    D. More impervious surfaces so rainwater can't infiltrate the ground and cause flooding.

11. How does burning fossil fuels contribute to climate change?

    A. Fossil fuels are a source of clean energy that does not contribute to air pollution.
    B. Fossil fuels do not contribute to climate change, only air pollution.
    C. Burning fossil fuels releases water vapor and makes the planet warmer.
    D. Burning fossil fuels releases CO2 and makes the planet warmer.

12. Why do scientists believe we should limit CO2 emissions?

A. Acid rain is still a problem.
B. The ozone layer is still shrinking.
C. To limit the worst effects of climate change.
D. To spur the economy by developing new sources of renewable energy.

13. If levels of greenhouse gases in the atmosphere continue to increase, temperatures on earth will …

A. stay the same
B. increase
C. decrease
D. cause the earth to turn into a ball of ice

14. What is the Acid Rain Program?

A. A program focused on monitoring atmospheric gases that result in acid rain.
B. A program dedicated to the human health effects of acid rain incidents.
C. A cap-and-trade program created to reduce the occurrence of acid rain.
D. A program focused on regulating clean-up for areas affected by acid rain.

15. Why is the Montreal Protocol significant?

A. It brought nations together to phase out harmful chemicals affecting the ozone layer.
B. It was the first example of an international energy code to reduce fossil fuel usage.
C. It set aside funds to help with future environmental disasters across North America.
D. It was the precursor to the modern-day Environmental Protection Agency.

16. Which of the following best defines mitigation?

A. Making green building standards more widespread
B. Reducing the cost of construction
C. Creating more energy efficient buildings
D. Designing buildings to be resilient

17. Which of the following is an example of adaptation?

A. Constructing and operating buildings to be resilient to heavy storms.
B. Alleviating the effects of climate change by designing net zero buildings.
C. Improving codes and policies that result in less energy waste.
D. Designing energy efficient buildings.

18. Buildings are responsible for approximately ___% of the energy used in Malaysia.

A. 22%
B. 35%
C. 48%
D. 60%

19. What is considered "clean" energy?

A. Energy sources that do not emit greenhouse gases.
B. Energy sources that emit greenhouse gases.
C. Energy generated from coal.
D. Energy generated from natural gas.

20. Green building considers the cost of the material as well as the energy used to create the product such as mining, harvesting, processing and transporting it to the site.

A. True
B. False

PART C

Q5 Answer the question about Green Building Terminology and solve the crossword puzzle in **Figure Q5**. The space between two words are excluded.

Across

2. The consecutive, interlinked stages of a product, beginning with raw materials acquisition and manufacture and continuing with its fabrication, manufacture, construction and use, and concluding with a variety of recovery, recycling, or waste management options.

5. Is the process in which contaminants and sedimentation are removed from stormwater runoff. Stormwater is collected into the treatment area which consists of a grass buffer strip, sand bed, ponding area, organic layer or mulch layer, planting soil, and plants. Runoff passes first over or through a sand bed, which slows the runoff's velocity, distributes it evenly along the length of the ponding area, which consists of a surface organic layer and/or groundcover and the underlying planting soil. The ponding area is graded, its center depressed.

7. Stable, artificially created chemical compounds containing carbon, chlorine, fluorine and sometimes hydrogen. It is used primarily to facilitate cooling in refrigerators and air conditioners, deplete the stratospheric ozone layer that protects the earth and its inhabitants from excessive ultraviolet radiation.

9. Is the unintentional or accidental introduction of outside air into a building, typically through cracks in the building envelope and through use of doors for passage. Infiltration is sometimes called air leakage. Infiltration is caused by wind, building pressurization and by air buoyancy forces known commonly as the stack effect.

11. Measures conductivity and resistance to heat loss. It is used for floors, walls, and roofs. The average number is between 3 and 3.5 per inch thickness of installed insulation. Increasing insulation reduces the amount of heat gain from the outside and the amount of conditioned air that escapes from the house.

14. A colorless, pungent-smelling material used as an adhering component of glues in many wood products, such as kitchen cabinets. It may cause respiratory problems, chemical sensitivity, and other health problems.

18. The replacement, upgrade or improvement of a piece of equipment or structure in an existing building or facility.

19. It is an invisible, radioactive atomic gas that results from the decay of radium, which may be found in rock formations beneath buildings or in certain building materials themselves. It is probably the most pervasive serious hazard for indoor air in the United States. It mitigation is an important aspect of green building.

20. Abandoned, idle or underused industrial or commercial buildings where expansion or development is complicated by real or perceived environmental contamination.

Down

1. Waste material composed primarily of constituent parts that occur naturally, are able to be decomposed by bacteria or fungi, and are absorbed into the ecosystem. Wood, for example, is biodegradable, while plastics are not.

3. It is used for direct conversion of light into electricity at the atomic level. Some materials exhibit a property known as the photoelectric effect that causes them to absorb photons of light and release electrons.

4. Disinformation disseminated by an organization to present an environmentally responsible public image. For example, a product lauded for its partial recycled content might not be "green" because it still contains undesirable contents or places excessive demands on energy consumption in its manufacture, packaging and distribution.

6. A process to carefully dismantle or remove useable materials from structures as an alternative to demolition. It maximizes the recovery of valuable building materials for reuse and recycling and minimizes the amount of waste entering landfills.

8. Comparing building's energy consumption adjusted for building area and climate with energy consumption of other buildings in the same category.

10. A naturally occurring, highly reactive, irritating gas comprising triatomic oxygen formed by recombination of oxygen in the presence of ultraviolet radiation. This gas builds up in the lower atmosphere as smog pollution, while in the upper atmosphere it forms a protective layer that shields the earth and its inhabitants from excessive exposure to damaging ultraviolet radiation.

12. It refers to the release of chemicals from various substances under normal conditions of temperature and pressure. You can probably think of a few examples of it. For example, when an area is painted, varnished, or stained, a strange scent often lingers for a few days. This is it, and the strange scent is caused by volatile organic compounds (VOCs), some of which are potentially hazardous.

13. Water that has been used for showering, clothes washing, and faucet uses. Kitchen sink and toilet water is excluded. This water can be reused in subsurface irrigation for yards.

15. Is the practice of placing windows or other openings and reflective surfaces so that during the day natural light provides effective internal lighting. Particular attention is given to it while designing a building when the aim is to maximize visual comfort or to reduce energy use.

16. Heating, ventilation and air conditioning (cooling) system.

17. Is the paved areas like streets and sidewalks, large business complexes and housing developments, and other industrial areas.

(20 marks)

– END OF QUESTIONS –

FINAL EXAMINATION

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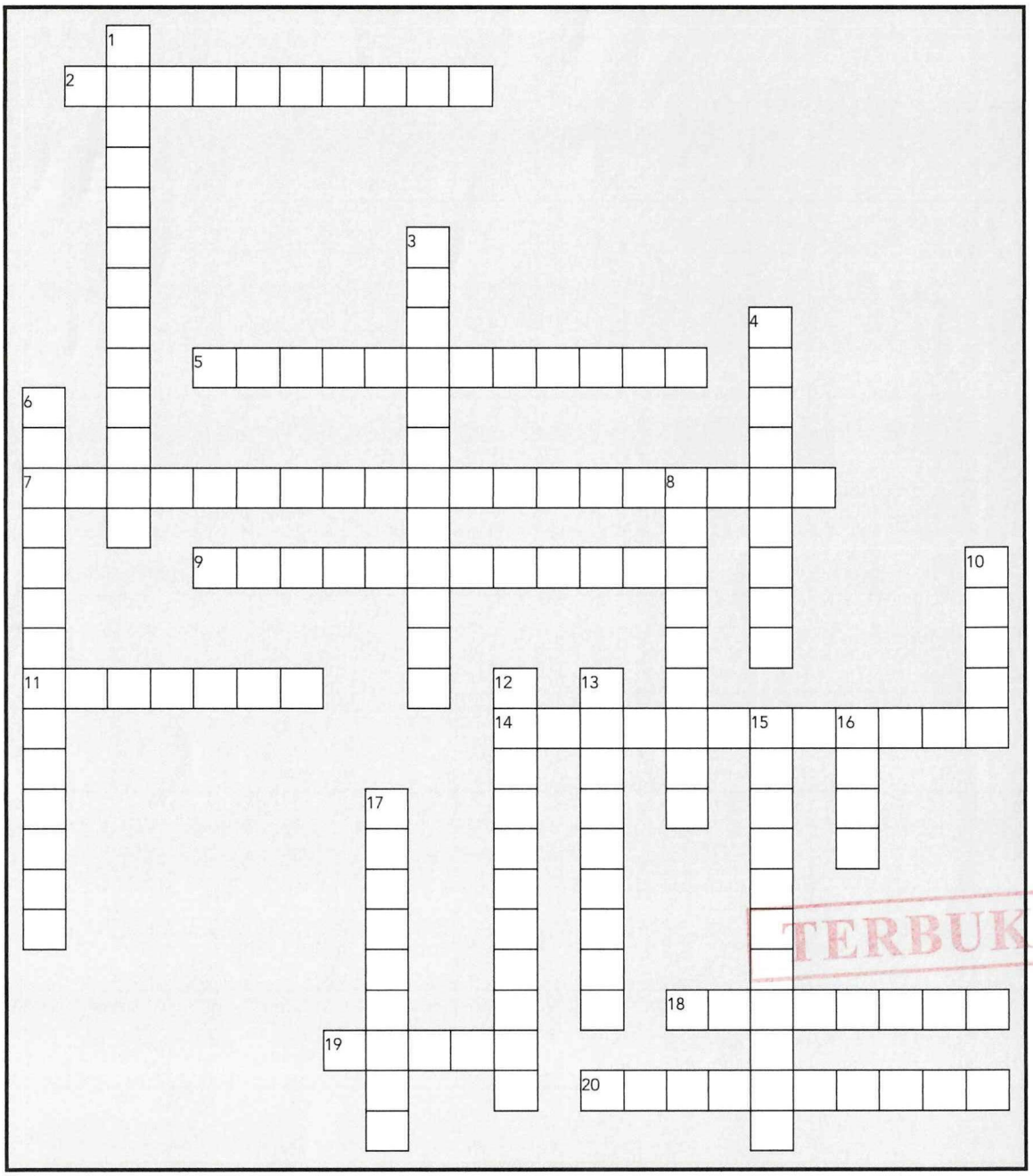

Figure Q5