QUIZ 1 (Modules 1 – 4) 20 Multiple Choice Questions (20 Marks)

Choose the **BEST** answer to each question. Carefully consider the meaning of each statement.

1. Environmental stewardship is:
    a. Harnessing the power of nature for the betterment of human kind.
    b. An attitude of care toward the natural world.**
    c. Ensuring that all engineering activities contribute to healthy ecosystem function.
    d. The same as sustainable development.

2. Global population in 2050 (i.e. by about the end of your working career) is estimated to be:
    a. Approximately 7 billion.
    b. Between 8 and 10 billion.**
    c. Between 12 and 15 billion.
    d. Approximately 20 billion.

3. According to NASA, what is a key indicator of global climate change?
    a. Atmospheric C02 concentration
    b. Average global temperature
    c. Area of Arctic Sea Ice
    d. All of the above**

4. Canada has met its targets for reduction in CO2 emissions relative to 1990 levels.
    a. True
    b. False**

5. Professor Peter Newman describes the three sectoral dimensions of sustainability. They are:
    a. The Market, The Community, The Government.**
    b. The resource sector, the financial sector, the not-for-profit sector.
    c. The economy, the society, the environment.
    d. The human community, the animal community, the plant community.

6. What is the difference between an expert learner and a novice learner:
    a. Experts have higher intelligence scores than novice learners
    b. Unlike experts, novice learners tend to believe that failure is due to deficiencies that cannot be remedied (eg "I'm just not smart enough").**
    c. Expert learners are unmotivated.
    d. None of the above.

7. An example of argumentation "evidence" is:
    a. Statistical analysis of a data set.
    b. A photographic image.
    c. A personal experience.
    d. All of the above are examples of "evidence" that can be part of an argument**

8. What is a unique characteristic of a profession?
    a. A profession is self-regulating.
    b. A professional has an obligation to set fees in accordance with the standard published by government.
    c. A profession is charged with a substantial degree of public obligation and performs its services largely in the general public interest.
    d. A profession must organize into an association that monitors all legal interactions between the profession and its clients.**

9. In recommending actions, the professional engineer should not limit his/her considerations to only technical issues.
    a. True**
    b. False

10. The "Big-Five" personality traits are openness, conscientiousness, narcissism, "Machiavellianism, and psychopathy.
    a. True
    b. False**

11. Which of the following can be described as a system?
    a. 10 rocks
    b. Your brain
    c. A community of coral polyps (i.e. a coral reef)
    d. Both b and c.**

12. An example of systems thinking is:
    a. Counting the number of components in a system.
    b. Asking questions and not taking anything at face value.
    c. Estimating systemic errors.
    d. Observing relationships between things.**

13. Concept Maps are structured:
    a. With spokes of "secondary concepts" radiating from a "central" or "primary concept".
    b. Such that they are round
    c. Concept maps have no structure
    d. As a hierarchy.**

14. The two key characteristics shared by both biological and industrial organisms are:
    a. resource utilization and life-cycles.**
    b. ability to reproduce and mutual interactions.
    c. Use of oxygen and life-cycles.
    d. Ability to re-produce and use of oxygen.

15. Specific examples of events or objects are essential components of the highest quality concept maps.
    a. True.**
    b. False.

16. The term "urban metabolism" describes:
    a. organic aspects of an urban environment
    b. the natural aspects of the urban environment
    c. cities as complex, thermodynamically open, self-organizing organisms**
    d. cities that are sustainable.

17. The primary infrastructure system driving growth and change of cities is the:
    a. social system
    b. water system
    c. transportation system**
    d. both a and b

18. A critical system closely aligned with the built environment in the megacity is:
    a. The political system.
    b. The education system.
    c. The cultural system.
    d. The public health system.**

19. The Integrated Design Process for buildings is initiated at the following stage in the design/build process:
    a. pre-design (i.e. programming) discussions**
    b. conceptual design stage (a.k.a. conceptual design)
    c. detailed design stage (a.k.a. detailed design)
    d. construction stage

20. A design charette is:
    a. a process that monitors progress in the Integrated Design Process.
    b. a room in which walls display 3-D images of design options so that designers can "walk-through" their ideas.
    c. the package of all design drawings that is passed from the architect to the engineers
    d. none of the above**

Part 2 Short Answer Questions (15 Marks)

21. Concept Maps (10 marks)

Use the following focus question to construct a preliminary list of ranked concepts, including at least 5 examples:

" Given the notion of "regenerative sustainability" (including the drivers and imperatives of sustainability), what are the "regenerative infrastructure" components in megacities?"

PRELIMINARY LIST OF RANKED CONCEPTS
Note:
The list doesn't need to be perfect. For this question, I would expect that you would certainly include ALL the concepts that are bold. I would also expect that you would "drill down" to at least level 5 for two of the bolded concepts OR "drill down" to at least level 3 for ALL the bolded concepts.

Drivers for Sustainability
   ### *Population Growth*
   ### *Per-Capita Consumption Growth*
   ### *Climate Change*
   ### *Air, Water, and Land Emissions*
Three Imperatives
   ### *Ecosystem Function*
   Clean air, water, natural lands, climate
   Healthy populations of native species
   Sources of food
   Viable land
   Other
   ### *Human Well-being*
   Personal Health and Development
   Community Health
   Education
   Equitable distribution of wealth
   Other
   ### *Economic Vibrancy*
   Healthy monetary system
   Healthy banking system
   Employment
   Diversity
   Other

Regenerative (i.e. sustainable) Infrastructure
   ### *Transportation*
   Roads, Rails, and other hard infrastructure

Public transportation
Transportation of Goods, including food
Emergency and Military Transportation
Transportation for private individuals
River Transport
Air Transport

Energy
Energy Sources
    Fossil Fuels
        Coal
        Oil
        Bitumen
        Natural Gas
    Photovoltaics
    Tidal
    Wind
    Nuclear
    Hydro
        Large Dam
        Run-of-River
Energy Needs
    Heating
    Lighting
    Cooking
    Electrical Devices including communication devices
    Commercial energy needs
    Transportation needs
Energy Conveyance Systems
    Electrical grid
    Liquid fuel transport

Buildings
Housing
Businesses
    Food
    Shops
    Services
    Finances
    Manufacturing and assembling plants
Government Offices
Schools
Religious buildings
Medical buildings
Cultural buildings

Drinking Water System
Water Source
    River
        Reservoir

Lake

Aquifer

Other

Water treatment facilities

Energy Needs

Piping system (build, operate, maintain, renew)

Waste Water System

Treatment facilities

Energy Needs

Piping system (build, operate, maintain, renew)

Receiving waters

Storm Water System

Pervious and impervious surfaces

Cisterns

Swales

Green roofs and other sustainable technologies

Piping system

Receiving waters

Recycling and Solid Waste System

Sorting system

Collection system

Processing system

Reuse system and landfill system

Communications Systems

Wireless system

Wired system

Food System

Farming

Transportation

Distribution

Public Health

Disease prevention system

Treatment facilities

Availability of treatments

Public Health Practitioners

22. In Lesson one of Module 4, you learned that urban planners characterize cities by a very simple analysis that identifies the general material entering and leaving a city on a mass/year basis. You were presented with the example of Sydney Australia.
Assuming that Vancouver is very similar to Sydney, What are the four material flows entering Vancouver and what are the four material and energy flows leaving Vancouver, on an annual basis? Which of the material inflows is the largest? Which of the material outflows is the largest? (5 marks)

INFLOWS   *OUTFLOWS*
Fuels   *Air Emissions*
Water*   *Waste Water***
Food   *Solid Waste*
Material   *Waste Heat*

*Water is the largest annual inflow on a mass basis
**Waste water is the largest annual outflow on a mass basis

PART 3: ARGUMENTATION QUESTION (5 marks)

In clear and concise, grammatically correct, sentences, answer the following question.

23. Analyze a primary claim make by Homer-Dixon in his article:

Homer-Dixon (2009) "The Newest Science: Replacing physics, ecology will be the master science of the 21st century"

23.1 Describe a primary claim made by Homer-Dixon.

A primary claim of the Homer-Dixon article can be paraphrased as follows:

Humans should use ecosystems as a metaphor for how the 21st century world works. We need to apply Complex Adaptive Systems (CAS) theory to model today's technologies and socio-technical systems, and to inform both social and economic policies.

(Note: You may describe a different primary claim or you may articulate the primary claim described here using different words. The critical part of this question is that you successfully identify a claim that is supported by reasons and evidence in the article).

23.2 What are the reasons given by Homer-Dixon that support this claim?

REASON 1: Homer-Dixon reasons that the current "mechanistic" way of thinking has serious short-comings.

REASON 2: Homer-Dixon also argues that today's interconnected world is simply more comparable to an ecosystem than a machine.

REASON 3: Finally, Homer-Dixon postulates that social and economic policies, as well as technologies, arising from CAS theory, will lead to resilience, in the same way that ecosystems are resilient.

23.3 Please state the evidence Homer-Dixon provides in support of each reason you identified in question 23.2 above.

EVIDENCE FOR REASON 1: For example, he reminds us of the collapsed fisheries (due to over fishing) and declining forests (due to flawed slivaculture practices). He then points to the "mechanistic-thinking" on which government policies for managing these large, living, natural-resource systems are based, and suggests that this think is the root cause for the struggling resources. He also blames mechanistic thinking for global economic crises, most recently in 2008.

EVIDENCE FOR REASON 2: In a world where we are "surrounded by unknown unknowns", the ideas mechanistic idea of "cause and effect", i.e., where we can " precisely predict the behaviour of critical systems", seems nonsensical. In contrast, the theory of Complex Adaptive Systems (CAS), which arises from studying ecosystems, seems to explain much of modern experiences.

EVIDENCE FOR REASON 3: Homer-Dixon is not able to provide direct evidence that this will happen, that is, he does not provide us with examples of successful economic and social policies that are based on CAS theory. He suggests that building resiliency into our critical systems will avert catastrophic responses but he does not present the next step of how such resiliency might be achieved.