1. C ✓ 2. C ✓ 3 C ✓ 4 D ✓ 5 D ✓ 6 D ✓ 7 C ✓ 8 C ✓
9. D ✓ 10. D ✓

11. 90 marks. NTU School of Art, Design and Media and Clean-Tech One. ✓

12. iii, i, ii ✓

13. Material extraction, material processing, manufacturing, product use, end of life ✓

14. Durability, Longevity, Re-cyclability, multi-functionality, disassembly, dematerialize ✓

15. ~~4~~ 2, 1 ✓ (4, 2, 1)

16. Carbon footprint ✓ 17. Food miles ✓

18. i) construction material ✓
ii) industrial minerals ✓
iii) metals ✓
iv) non-renewable organics ✓
v) agricultural products ✓

Section B

1. Land reclamation — causes water pollution at the sea
Floating platforms on water surface — disturb the marine ecosystem and freshwater ecosystem
Underground space — high technology and cost are needed. It also contributes to land pollution and air pollution as tunneling produces dust
Tall Vertical building — It may interfere with the air navigation and cause overshadowing and overlooking to adjacent building

2a) Conservation of heritage buildings allows us to use back the old structure and material without the ~~ne~~ that are already present

b. Mass transportation will help to reduce carbon emission and air pollution. It also greatly reduces the amount of cars needed to transport ~~used~~ certain amount of people, hence it then reduces the material needed for car manufacturing.

c. This will help to safeguards future road and rail corridors between landuses hence no development is allowed on these reserves which will hinder future construction of the transport infrastructure. Thus no demolition is required of existing building is required when the reserved area is needed for building transportation facilities.

d. Pocket park helps to keep the environment green and clean.

3a) World war and ~~tsunami~~ disease ✓

b) residential and industrial ✓

c) air navigation and telecommunication ✓

d) road pricing and car pooling ✓

e) people and goods ?

f) work to people ✓

111

4. Plot ratio is the building floor spce area divided by site area - where building floor spce is the total area for all storeys.

$$1.6 = \frac{x}{0.8}$$

$x = 1.28$ hectares

1.28 hectares = 12800 m^2

~~The building floor~~ As ↑ building floor spce indicates ↑ height of building; hence when plot ratio increases, the height of the building should not be interfere with air navigation and telecommunication.

Section C

a) Fish Mouth, Feishayan. Baopington

~~b) Feishayan — helps to drain out excess water from inner and to outer system.~~

~~It also serves the functions of sediment~~

b) Feishayan – It serves the function of water diversion and sediment and flood discharge for the inner river. It helps to drain out excess water from inner to outer system.

Section D

1D ✓ 2D ✓ 3B ✓ 4B ✓ 5C ✓

Section E

Codes of Ethics, professionalism, social contract model, engineering societies, principle of proportionate care.

- Engineers ~~shall~~ will speak out against abuses in the areas that are affecting the public interest (code of ethics)
- A professional is one who is with only "duly qualified" in a specific field with special theoretical knowledge or education so that they will perform the tasks only in their respective ~~area~~ specialised area and do not put public in harm. (professionalism)
- Engineers are the guardians of the public trust as they are granted special powers in return for socially beneficial goods and services. (social contract model)

- society grants the professions the autonomy to define their own norms of behavior and action because it values their ~~bound~~ knowledge and the direction to use it towards some socially ~~reg~~ recognized and. (engineering societies)

~~with the~~ ¶

- by abiding principle of proportionate care, engineer will exercise greater care to avoid, contributing to significantly harming others. (pindple of proportionate care).

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