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|--|------------|------------------|---|---------------------------------|--|---|-----------------------|--|
| Spring Term Exam for IPSE of CSE, 2013 | | | | 30th, July, Tuesday | | | From: 15:00, To:16:30 | |
| Subject | Instructor | Department, Year | | Answer Separate Reference | Reference tools are not allowed without admission. | 1. Nothing 2. Free 3. Partly allowed •Textbook • Reference book • Calculator • Dictionary • Others [] | | |
| Geotechnical Engineering | H. Akagi | Civil & Env. | 2 | | | | | |
| Student ID | Name | | | Mark | | | | |

Select four items of questions from those shown below. Indicate the number of selected question and your answers on the separate answer sheet.

Question 1:

What kinds of excavation machines have been used for the braced excavation?

Question 2:

What is Finite Element Method? Explain the normal calculation procedure for FEM in the case of geotechnical engineering.

Question 3:

What's a tunnel made of? What's the Principle of Tunnel?

Question 4:

Explain three types of tunnel construction methods respectively, Names, Methods, Merits, Weak points.

Question 5:

Identify a Profile. Given the topographic map in Fig.1, which of the four choices shown in Fig.1 below accurately depicts the correct profile between points X and Y? Describe the reason of your choice.

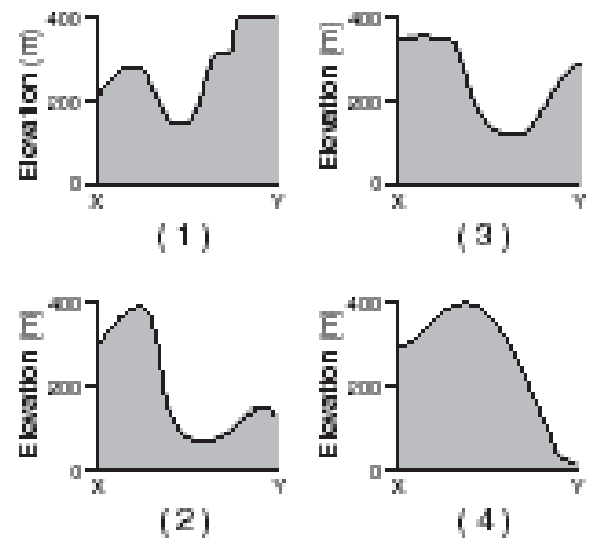
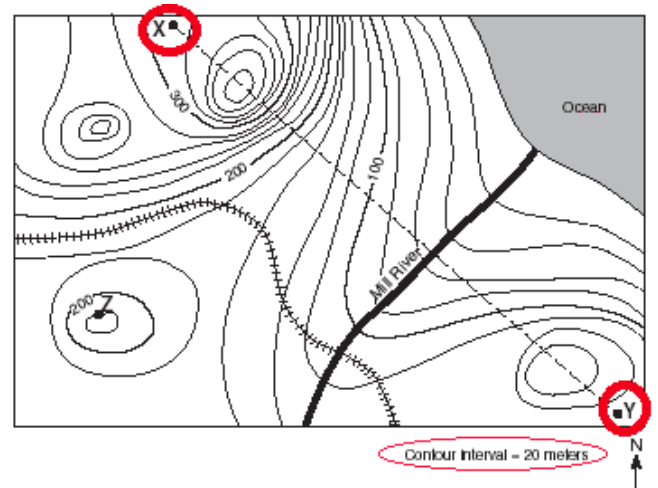


Fig.1

Question 6:

- Describe the order of forming topography in Fig.2 from 1 to 6.
- Which of from 1 to 6 was formed simultaneously with A?

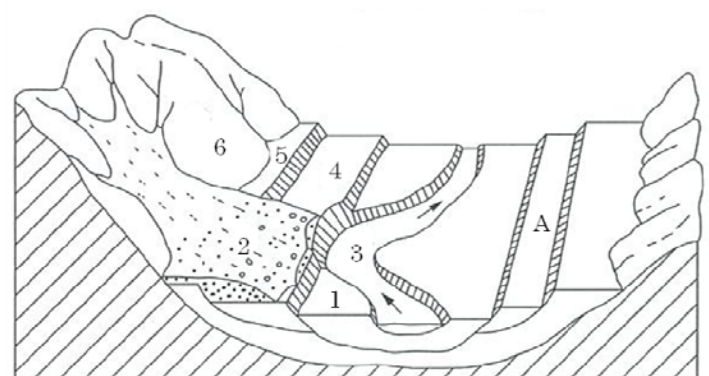


Fig.2

Question 7:

Calculate the increase of the seismic energy (E) of an earthquake, when the magnitude (M) increases by 2!

$$\log_{10} E = 4.8 + 1.5 \times M$$

When the magnitude increases by 1, the seismic energy of an earthquake increases by approximately 30 times.

Question 8:

Obtain the un-damped natural circular frequency ω and the natural period T of SDOF system shown in Fig.3.

- Weight of particle: $W=9,800$ (kN)
- Spring constant: $k=1,579$ (kN/cm)
- Gravity : $g=980$ (cm/sec²)
- $\pi = 3.14$

End of questions.

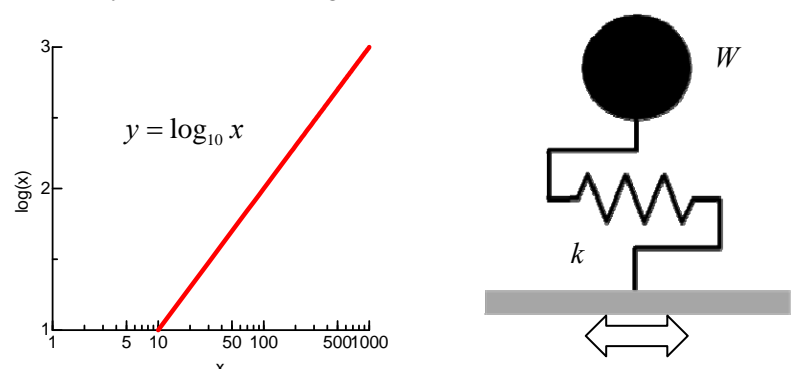


Fig.3

International Program, Department of Civil and Environmental Engineering

Answer sheet for Spring Term Exam, Geotechnical Engineering, 2013

Student ID _____ — Name _____ Mark _____

| | | | |
|--|---|-----------------------|---|
| Answer | 1 | Selected Question No. | 1 |
| Auger type machine, Trench excavation type machine, TRD type machine | | | |
| Answer | 2 | Selected Question No. | 2 |
| Numerical method to obtain the deformation and the stress distribution within the ground. 1) Finite element mesh creation. 2) Input of material properties and boundary condition. 3) Solution of simultaneous equation. 4) Output of calculation results. | | | |
| Answer | 3 | Selected Question No. | 3 |
| A tunnel is made of ground. Deformation causes to tunnels to reach the stable state and the ground is necessary to support the tunnel from the deformation. | | | |
| Answer | 4 | Selected Question No. | 4 |
| Shield tunnelling method: TBM is used and the segment ring is used to support the ground. NATM: Primary lining is produced by spray concrete. Mountain tunnelling method: Bracing is used to tunnel support. | | | |
| Answer | 5 | Selected Question No. | 5 |
| (2): The elevation of point X is around 300m and point Y is around 125m. | | | |
| Answer | 6 | Selected Question No. | 6 |
| 1) 6→5→4→2→1→3, 2) 4 | | | |
| Answer | 7 | Selected Question No. | 7 |
| 1000 times. | | | |
| Answer | 8 | Selected Question No. | 8 |
| $\omega = \sqrt{\frac{k}{M}} = \sqrt{\frac{1579 \times 10^5 \times 9.8}{10^6}} = 40(1/s), \quad T = \frac{2\pi}{\omega} = \frac{2 \times 3.14}{40} = 0.16(s)$ | | | |