University of Palestine
Faculty of Applied Engineering and Urban Planning

Course Name	Soil Mechanics			Course No.	CIVL 3318
Academic Year	2018/2019	Semester	2nd	Exam Type	Final
Exam Date	22/05/2019			Exam Time	12pm – 2pm

اسم الطالب(بالعربي):	الرقم الجامعي:	
اسم المدرس: د. ساري أبو شرار	رقم الشعبة: 101	وقت المحاضرة: 10:00am– 9:00 am	الرقم المتسلسل:

Important Instructions

- ***This is a closed-book exam; all related material must be placed away from your desk.***
- ***Cell phone use is prohibited for any purpose: Your cell phone must be turned off and placed off of the desk. Cell phones may not be accessed during the exam. Failure to comply may be treated as a violation of the Honor Code.***
- ***Headphones of any kind are not permitted.***
- ***This exam is 120 minutes long.***
- ***Make sure that you have 8 pages including this page.***
- ***This exam has 4 questions. Read each question carefully before answering.***
- ***Calculators can be used but cannot be shared.***
- ***When you finish, you must:***
  - ***Check that you have written your information in the spaces provided.***
  - ***Give the exam package (all papers) to the proctor before you leave.***

For Teacher's Use Only **For Proctor's Remarks**

QN	KPI/ILO	SO	DL	Mark	Weight
1	b1, b2	a, b, c	3		20
2	b1	k	2		10
3	b2	a	6		10
4	b3	c	5		10
Total					**50**

KPI: Key Performance Indicator, ILO: Intended Learning Outcomes, SO: ABET Student Objectives, DL: Difficulty Level (1. Very easy, 2. Easy, 3. Moderate, 4. Somewhat hard, 5. Hard, 6. Very Hard)

Answer All Questions

Q1. Choose the correct answer (20/50)

1. A line showing the water content dry density relation for the compacted soil is _____
   a) Zero air voids lines
   b) Air-voids line
   c) Density line
   d) All of the mentioned

2. Which of the following property of soil is improved by compacting the soil?
   a) Reduction of compressibility
   b) Water absorption
   c) Permeability
   d) All of the mentioned

3. The grain size curve of the filter should be parallel to that of _____
   a) Base materials
   b) Filter
   c) Seepage discharge
   d) All of the mentioned

4. What are the types of flow head that exist at any point in a saturated soil mass?
   a) Piezometric head or pressure head
   b) Velocity head
   c) Position head
   d) All of the mentioned

5. Seepage pressure is important for which of the following purpose?
   a) Stability analysis
   b) Structral arrangement
   c) Total head
   d) All of the mentioned

6. A flow net can be used for which of the following purpose?
   a) Determination of seepage
   b) Determination of seepage pressure
   c) Determination of hydrostatic pressure
   d) All of the mentioned

7. What are the types of water flow in the soil?
   a) Turbulent flow and Laminar flow
   b) Linear flow
   c) None of the mentioned
   d) All of the mentioned

8. Stiff clays are _____ permeable.
   a) Highly
   b) Least
   c) Partially
   d) None of the mentioned

9. The study of seepage of water through soil is important for, which of the following purpose?
   a) Drainage of soils
   b) Stability of slopes
   c) Ground water flow towards well
   d) All of the mentioned

10. Darcy's law is valid for only _____
   a) Laminar flow
   b) Turbulent flow
   c) Hydraulic flow
   d) All of the mentioned

11. What is the relationship between permeability and viscosity of water?
   a) Directly proportional
   b) Inversely proportional
   c) Both are equal
   d) None of the mentioned

12. Which of the following factors affects the permeability of soil?
   a) Grain size
   b) Properties of pore fluid
   c) Void ratio of soils
   d) All of the mentioned

13. The sedimentation analysis is based on _____ law.
   a) Stoke
   b) Cullman's
   c) Rankine's
   d) None of the mentioned

14. Viscosity of water/liquid (η) is expressed in _____
   a) KN-s/m^3
   b) Ns/m^2
   c) KN-s/m^2
   d) Ns/m

15. A curve with a flat portion, in particle size distribution curve represent _____
   a) Intermediate size particle are missing
   b) Intermediate size particles are present
   c) Smaller size particle are present
   d) Large size particles are present

16. The Swedish agriculturist who divided the entire range of consistency from liquid to solid states is _____
    a) Dupuit's
    b) Laplace
    c) Boussinesq
    d) Atterberg

17. Which of the following is not considered as one of the state, as divided by Atterberg?
    a) Solid state
    b) Gaseous state
    c) Semi-solid state
    d) Liquid state

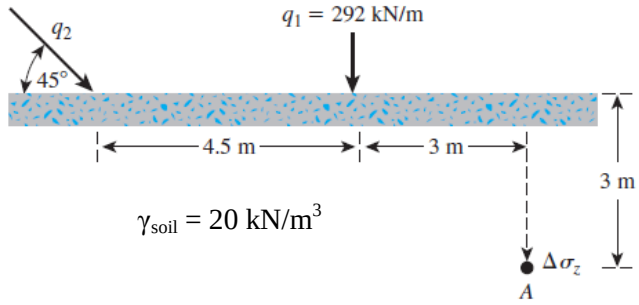
18. Unified soil classification system (USCS) was developed by _____
    a) Kozney
    b) Atterberg
    c) Casagrande
    d) Rankine

19. The USCS system was used for which of the following purpose during World War 2?
    a) Air field construction
    b) Dam construction
    c) Foundation
    d) Earth slopes

20. A soil is considered as coarse grained, if it retains more than _____ in a sieve.
    a) 90% of the soil
    b) 70% of the soil
    c) 50% of the soil
    d) 20% of the soil

Answer	1	2	3	4	5	6	7	8	9	10
	11	12	13	14	15	16	17	18	19	20

Q2. Due to the application of line loads q_1 and q_2, the vertical stress increase, $\Delta\sigma_z$, at point A is 42 kN/m^2. Determine: (10/50)



For Vertical Line Load

$$\Delta\sigma_z = \frac{2qz^3}{\pi(x^2 + z^2)^2}$$

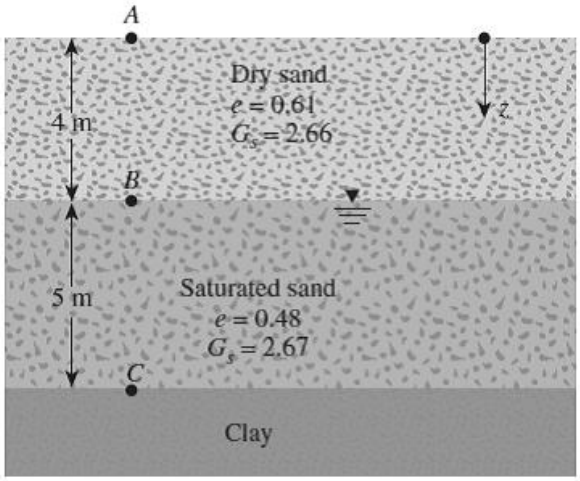
For Horizontal Line Load

$$\Delta\sigma_z = \frac{2q}{\pi}\frac{xz^2}{(x^2 + z^2)^2}$$

a. The magnitude of q2. (5 points)

b. The total vertical stress at point A. (5points)

Q3. Refer to the soil profile shown in figure below: **(10/50)**



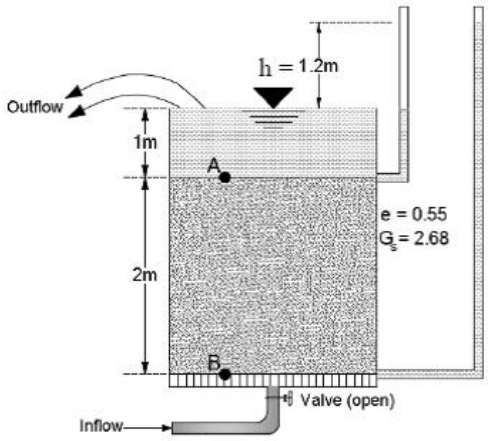
Dry unit weight (γ_d)		Saturated unit weight (γ_{sat})	
Given	Relationship	Given	Relationship
γ, w	$\frac{\gamma}{1+w}$	G_s, e	$\frac{(G_s+e)\gamma_w}{1+e}$
G_s, e	$\frac{G_s\gamma_w}{1+e}$	G_s, n	$[(1-n)G_s+n]\gamma$

a. Calculate the variations of σ, *u*, and σ' at points *A*, *B*, and *C* with depth. **(5 points)**

b. If the water table is rises to the top of the ground surface, what is the change in the effective stress at the bottom of the clay layer? (3 points)

c. How many meters must the ground water table rise to decrease the effective stress by 15 KN/m^2 at the bottom of the clay layer? (2 points)

Q4. For the figure shown below, if the area of the tank is 0.5 m2 and hydraulic conductivity of sand is 0.1 cm/sec. (10/50)



a. What is the magnitude and direction of the rate of seepage? (4 points)

b. If the value of h=1.2m, will boiling occur? (3 points)

c. What should be the value of "h" to cause boiling? (3 points)

End of Questions