KATHMANDU UNIVERSITY
End Semester Examination
August/September, 2017

Mark Scored:

Level : B. E.
Year : III

Course : CIEG 317
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : SEP 13 2017

SECTION "A"
[20 Q × 0.5 = 10 marks]

Choose the most appropriate answers:

1. The capacity of rock to strain under applied loads is known as
   c) Tension b) Elasticity c) Shear modulus d) Deformability

2. The rock strength increases as confining pressure
   a) Decreases b) Increases
   c) Initially decreases and then increases d) Initially increases and then decreases

3. The variation of peak stress with confining pressure is known as
   a) Creep b) Shrinkage c) Elasticity d) Failure criteria

4. The minimum strength reached by a material subjected to deformation beyond the peak strength
   a) Residual strength b) Average strength
   c) Peak strength d) In between peak and average strength

5. Basically, rock mass classification approaches are used for
   a) Estimation of stress at tunnel support
   b) Estimation of residual strength of rock mass
   c) Estimation of tunnel support
   d) Estimation of tunnel displacement

6. Rock quality designation is defined as the percentage of intact core pieces
   a) Longer than 10 mm b) Shorter than 100 mm
   c) Shorter than 10 mm d) Longer than 100 mm

7. When an opening is excavated in the rock, the stress field is
   a) Undisturbed b) Locally disturbed
   b) Immediately reached to residual state d) Always reached to peak value

8. The stress ratio, K
   a) Tends to be high at shallow depth and it decreases at depth
   b) Tends to be low at shallow depth and it increases at depth
   c) Remains constant as depth increases
   d) Increases with depth

9. Elastic plastic analysis post failure characteristics is used for
   a) Very good rock mass b) Average quality of rock mass
   c) Good and hard rock mass d) Very poor quality soft rock mass

10. Failure initiates at the boundary of an excavation when
    a) Rock mass strength is exceeded by the stress induced
    b) Rock mass strength is infinity
    c) Rock mass strength is equal to the stress induced
    d) Rock mass strength is very low

11. Shear failure refers to
    a) Displacement of ground above the excavation.
    b) Formation of a surface rupture.
    c) Displacement of ground below the excavation.
    d) Rock mass volume reduction.

12. Tensile cracks are formed when modes of failure is
    a) Flexure
    b) Shear
    c) Compression
    d) Both flexure and compression

13. Non-deviatoric stresses are
    a) Tension and equally applied in all direction
    b) Compression and equally applied in all direction
    c) Tension and applied in only one direction
    d) Compression and applied in only one direction

14. Deviatoric stresses are
    a) Normal and shear stresses that remains after adding a hydrostatic stress
    b) Normal and shear stresses are equal
    c) Normal and shear stresses that remains after subtracting a hydrostatic stress
    d) Normal and shear stresses are equal with hydrostatic stress

15. Non-deviatoric stress to a rock
    a) Produces a volume increase and changes the rock fabric permanently
    b) Produce a volume increases
    c) Neither volume increase nor changes rock fabric permanently
    d) Produces a volume decreases and changes the rock fabric permanently

16. Hydraulic fracturing is used for
    a) Estimation of rock stresses at the surface of the ground
    b) Estimation of rock stress at the face of the rock
    c) Estimation of rock stresses in the rock at the considerable depth using borehole
    d) To fracture the rocks during tunneling

17. Flat jack test method is used for estimation of stresses at
    a) Borehole
    b) Rock face of underground gallery
    c) surface of the slope
    d) surface of flat concrete slab

18. The shear stress of rock mass increases rapidly until
    a) The peak strength is reached
    b) The residual strength is reached
    b) Just below the peak strength
    d) Just start of residual strength

19. Due to presence of water in rock mass
    a) The normal stress significantly increases
    b) The normal stress is reduced
    b) The shear stress is increased
    d) The compression stress is increased

20. Generally, flexure failure occurs
    a) Above the roof of excavation
    b) At the wall of excavation
    c) At the bottom of excavation
    d) At the surface above excavation

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SEP 1 3 2017

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Year : III
Time : 2 hrs. 30 mins.

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Semester : II
F. M. : 40

SECTION "B"
[5 Q. × 8 = 40 marks]

Attempt *ALL* questions. Candidates are required to give their answers in their own words as far as practicable.

1. Describe the different types of laboratory strength tests of rock. Discuss the stress-strain behaviour of rock and its application. [4+4]

2. Define the different types of rock stresses. Describe the techniques of stress measurements in field. [4+4]

3. Explain the different modes of rock failure with neat sketches. Discuss the Mohr-Coulomb failure criterion of rock and its application. [4+4]

4. Explain the shear strength of both planar and rough surfaces. Define the deformability of rocks and methods of measurements in field. [4+4]

5. Write short notes on the following. (*ANY TWO*) [4+4]
   i) Effects of confining pressure in rock strength
   ii) Direct shear test of rock
   iii) Stress distribution around circular opening