05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Rock Slope Engineering *(Elective II) (CE76507)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary Chart and Tracing paper are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. Explain the importance of rock slope engineering in transportation planning and design in Nepal. [4]
2. List the methods for rock slope stability analysis. Describe about limit equilibrium analysis and probabilistic method. [8]
3. What are the effect of ground water in slope stability? Describe protective measures with example. [4]
4. Describe briefly how shear strength of planar discontinuities is determined according to Barton (1971). Also explain with neat sketches field shear strength test. [5+3]
5. Explain how earthquake can be quantified for rock slope stability analysis. Explain earthquake induced stability analysis in brief. [3+3]
6. Explain graphical techniques for geological data problem. List out the advantages and disadvantages of equal area net with respect to equal angle net. [2+4]
7. Describe the procedure of geologic mapping of surface out crops or existing cuts. Also mention the mapping of exposed structures. [4+2]
8. Describe in brief support method and principles. Suggest the protective measures for the control of rock fall with sketches. [4+4]
9. A 15m high rock slope has been excavated at a face angle of 65°. The rock in which this cut has been made contains persistent bedding planes that dip at an angle of 35°into the excavation. The 4.35m deep tension crack is 4.5m behind the crest, and is filled with water to a height of 3m. [10]
   Given;
   Cohesion, c = 25 kPa
   Friction angle, Φ= 30°
   Seismic acceleration, α = 0.08 g

   The unit weight of the rock is 26kN/m^3, and the unit weight of the water is 9.81 kN/m^3.

   Calculate the factor of safety of the slope for the conditions given for critical depth of tension crack.
10. Consider a 7.2m high slope with an overhanging face at an angle of 60°.There is a fault, dippingat an angle of 15°out of the face, at the toe ofthe slope that is weathering and undercutting theface. A tension crack, which is wider at the top than at the bottom, has developed 1.8m behindthe crest of the slope indicating that the face is marginally stable. The friction angle ϕ of the fault is 20°and the cohesion c is 25 kPa.The slope is dry.
    (a) Calculate the factor of safety of the block against sliding if the density of the rock is 25kN/m^3.
    (c) How much more undercutting of the fault must occur before toppling failure takes place?
    (d) What stabilization measures would be appropriate for this slope? [6]

11. Determine the factor of safety for following wedge failure. [14]

$\gamma_r = 26$ KN/m^3

$\gamma_w = 10$ kN/m^3

Total Height of the wedge, H = 28m

Plane	Dip	Dip Direction	Shear Parameters
3	60	360	$\Phi = 30$ and c = 50 kPa
5	54	118	
Slope Face	76	060	
Upper Surface	15	070	

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5 G TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Rock Slope Engineering *(Elective II) (CE 76507)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Necessary figures are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. What is the importance of rock slope engineering? What are the factors affecting slope stability of rock mass? [4]
2. What are the method of rock slope stability analysis? Describe about limit equilibrium analysis. [6]
3. What are the effects of ground water in slope stability? Give your own view for protecting slopes from the ground water. [4]
4. Explain how shear strength of planner discontinuities is determined according to Borton (1971). Explain the field shear strength test with sketches. [5+3]
5. List the slope parameters that have the greatest influence on stability during earthquakes. Describe the steps of seismic hazard analysis. [4+4]
6. Write the difference between equal area net and equal angle net. On the basis of these describe the procedures for evaluation of potetential slope problems. [3+3]
7. How would you execute the diamond drilling in the field? Explain briefly about core orientation. [6+2]
8. What are the assumptions of plane failure? Explain with neat sketches critical tension crack depth and location. [3+3]
9. Why Rock slope stabilization is necessary in slope stability? What are the different stabilization measures? [8]
10. A 14m high rock slope has been excavated at a face angle of 55°. The rock in which this cut has been made contains persistent bedding planes that dip at an angle of 33° into the excavation. The 4.75m deep tension crack is 4m behind the crest, and is filled with water to a height of 3m above the sliding surface. The strength parameters of the sliding surface are as follows:
    Cohesion, c = 25 kPa
    Friction angle, $\phi = 35°$

    The unit weight of the rock is 26 kN/m^3, and the unit weight of the water is 9.81 kN/m^3. Assuming that the plane slope failure is the most likely type of instability, analyze the following stability conditions.

    a) Calculate the factor of safety of the slope for the conditions given
    b) Design the rock bolt to obtain the factor of safety of 1.8 [8]
11. Determine the factor of safety for the following failure γ_r = 26 KN/m^3; γ_w = 10 KN/m^3. Total height of wedge H = 28m. [14]

Plane	Dip	Dip direction	Shear Parameters
3	60	360	ϕ = 32 and c = 25 kPa
5	54	118	
Slope face	76	060	

5 G TRIBHUVAN UNIVERSITY
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2073 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Rock Slope Engineering *(Elective II) (CE76507)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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- ✓ ***Necessary figures are attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. Explain the importance of Rock Slope engineering. List the main objectives of slope stability of rock mass. [4]
2. List out the methods for rock slope stability analysis. Explain types of Numerical Modeling. [8]
3. With neat sketches describe the protective measures and effect of ground water in slope. [4]
4. Describe briefly how shear strength of planar discontinuities is determined according to Barton (1971). Also explain with neat sketches field shear strength test. [5+3]
5. What are the greatest influencing parameters for slope stability during earthquake? What are the steps of seismic hazard analysis? [3+5]
6. List out the advantages and disadvantages of equal area net with respect to equal angle net. Describe the procedures for evaluation of potential slope problems. [3+5]
7. What procedure you apply while geologic mapping of surface out crops or existing cuts? Also mention the mapping of exposed structures. [4+2]
8. Nepal's mountains are suffering from the greater landslide every year. Describe the type of failure and conditions in brief. [8]
9. Describe in brief support method and principles. Suggest the protective measures for the control of rock fall with sketches. [4+4]
10. A 15 m high rock slope has been excavated at a face angle 64°. The rock in which this cut has been made contains persistent bedding planes that dip at an angle of 35° into the excavation. The 4.25 m deep tension crack 4.35 m behind crest and is filled with water to a height of 3.25 m. Here C = 25KPa; $\phi = 30°$ and seismic acceleration (α) = 0.08 g. The unit weight of rock and water is 26 KN / m^3 and 10 KN / m^3 respectively. Calculate the factor of safety of the slope for the conditions given for critical depth of tension crack. [10]
11. Consider a 6.2m high slope with an overhanging face at an angle of 65°. There is a fault, dipping at an angle of 15° out of the face, at the toe of the slope that is weathering and undercutting the face. A tension crack, which is wider at the top than at the bottom, has developed 1.7m behind the crest of the slope indicating that the face is marginally stable. The friction angle ϕ of the fault is 20° and the cohesion c is 25kPa. The slope is dry.
    a) Calculate the factor of safety of the block against sliding if the density of the rock is 23.5 kN/m^3.
    b) Is the block stable against toppling as defined by the relation? $\Delta x / y > \tan\psi_p$ stable?
    c) How much more undercutting of the fault must occur before toppling failure takes place?
    d) What stabilization measures would be appropriate for this slope? [8]

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