KATHMANDU UNIVERSITY
End Semester Examination
January/February 2025

Marks Scored:

Level : B.Tech.
Year : IV

Course : ESEE 432
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 09 FEB

SECTION "A"

[20Q. × 0.5 = 10 marks]

Choose the most appropriate answer from the given alternatives and ***encircle***.

1. What is bioengineering in slope stability?
   a. Using plants and vegetation to stabilize slopes
   b. Using traditional methods to stabilize slopes
   c. Using civil structures to stabilize slopes
   d. Using local materials to stabilize slopes

2. Which type of vegetation is commonly used in bioengineering for slope stabilization in Nepal?
   a. Cacti
   b. Bamboo and grass species
   c. Fruit trees
   d. Palm trees

3. For slopes with a steep angle (greater than 45°), known aspects and drainage materials which bioengineering technique is typically the most effective?
   a. Planting linear methods of shallow-rooted grasses
   b. Installing geosynthetics withsite specific vegetation
   c. Planting deep-rooted trees along with terracing and erosion control measures
   d. Using concrete retaining walls for achieving support function

4. Why is slope stability a critical issue in Nepal?
   a. The country has uneven terrains
   b. It is prone to landslides and floods, especially during the monsoon season
   c. The soil is too fertile for plant growth
   d. The infrastructure construction methods is not scientific and systematic in country

5. What is the primary purpose of using vegetation in slope bioengineering?
   a. To add aesthetic value and economic benefits
   b. To increase soil fertility
   c. To stabilize the soil and prevent erosion
   d. Habitat for wildlife

6. Which of the following is a disadvantage of bioengineering for slope stabilization?
   a. Required skill human resources
   b. Requires regular care and maintenance
   c. Less environmental benefits
   d. It is ineffective in areas with high rainfall

7. Which of the following is a common method of bioengineering used in Nepal to stabilize steep slopes?
   a. Seeding grasses and shrubs
   b. Creating artificial embankments
   c. Soil nailing
   d. Drilling boreholes

8. Which factor is the most significant in determining the success of bioengineering techniques in Nepal's slopes?
   a. Type of vegetation chosen
   b. Cost of materials
   c. Local cultural practices
   d. Distance from urban centers

9. What is a common form of soil erosion in the hilly regions of Nepal?
   a. Wind erosion b. Sheet erosion c. Rill erosion d. Gulley erosion

10. Which of the following bioengineering methods can help with surface water runoff in Nepal?
   a. Terracing and planting ground cover
   b. Installing stone barriers
   c. Using chemical agents to stabilize the soil
   d. Increasing road construction

11. Which plant root system is most effective in stabilizing slopes in Nepal's hilly regions?
   a. Shallow root systems
   b. Deep, extensive root systems
   c. Rootless plants
   d. Plants with fibrous roots

12. Which of these engineering techniques can complement bioengineering methods for slope stabilization in Nepal?
   a. Use of plastic sheets
   b. Concrete pouring
   c. Large-scale jute net
   d. Soil nailing

13. What role does bamboo play in bioengineering for slope stability?
   a. It increases soil porosity and permeability
   b. Its roots help bind the soil together
   c. It provides anchor function
   d. It absorbs excessive rainwater

14. Which of the following small civil engineering structures is commonly used in bioengineering to reduce soil erosion on slopes (rill and gulley erosion) in Nepal?
   a. Retaining walls
   b. Bolster construction
   c. Prop walls
   d. Check dams

15. What is the primary function of a "gabion" structure in bioengineering for slope stabilization in Nepal?
   a. To create pathways for vehicles and footrails
   b. To store water for agricultural purposes in hills
   c. To provide drain and catch functions
   d. To provide structural support and prevent soil erosion

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16. What is the main purpose of a "nursery bed" in Nepal?
    a. To grow plants for commercial sale
    b. To propagate and grow plants for bioengineering and slope stabilization
    c. To store composts and soil materials for young plants
    d. To grow a large number of plants for slope stabilization

17. Which type of retaining wall is most commonly used for slope stabilization in Nepal's hilly regions?
    a. Gravity retaining walls
    b. Toe retaining walls
    c. Cantilever retaining walls
    d. Revetment retaining walls

18. In Nepal, which factor is most important when designing retaining walls for slope stabilization?
    a. The height and width of the walls
    b. The aesthetic appearance of the walls
    c. The type of soil and its drainage capacity
    d. The design period of walls

19. Which of the following is commonly incorporated in the design of retaining walls for slopes in Nepal to prevent sliding?
    a. Use of drainage pipes behind the wall to reduce water pressure
    b. Use of plastic covers to maintain moisture levels in soil
    c. Strength of the wall to catch the falling debris
    d. Placement of cement barriers in front of the wall

20. What is the primary mechanism of slope failure in Nepal's hilly and mountainous regions?
    a. Soil liquefaction caused by earthquakes
    b. Expansion of roots from plants that destabilize the soil
    c. Compaction of soil due to human activities
    d. Slumping or sliding of soil and debris along the slope

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F. M. : 40

SECTION "B"
[8Q. × 5 = 40 marks]

Attempt *ALL* questions. Assume necessary data whenever required.

1. How is bioengineering introduced in Nepal and what are its key engineering functions and applications in the context of Nepal's infrastructures development sectors?

2. What are the primary causes and mechanism behind slope failure and how do they contribute to landslides and other related hazards?

OR

Describe the landslide mapping procedure.

3. How does plant ecology influence the distribution of plant species across different regions of Nepal, considering factors such as altitude, climate and soli types?

4. List out small scale civil engineering structures used in bioengineering and describe any two of them with their design consideration?

5. Why do the bioengineers need a nursery? Explain the factors that should be considered while establishing a bioengineering nursery.

6. Write a short note on the infinite slope model to calculate the factor of safety in slope stability analysis.

7. Calculate amount of increase in shear strength by using perpendicular root reinforcement model (Wu Model) in a slope after 6 years of tree plantation for the following given data:
Angle of internal friction=30 degree.
Area of root coverage=4 m^2

No. of roots	Root diameter(cm)	Tensile strength of root fibre (MPa)	Average angle of shear distortion
24	6	18	22
18	9	10	20
10	8	12	15
20	5	20	18

P.T.O.

8. Mention at least 5 differences between horizontal and vertical line of grass planation with figures.

OR

Describe about the functions, installation process and limitations of brush layering.