

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

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

Subject: - Bio-Engineering (Elective I) (CE72504)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ All questions carry equal marks.
- ✓ Assume suitable data if necessary.

1. Define bioengineering. Briefly explain about the engineering and hydrological functions of vegetative structures that are used in bioengineering techniques.
2. Explain about the major causes and mechanism of slope failure in hilly regions of our country.
3. Define plant ecology. What are the major factors that govern the distribution of plant ecology in different geological regions of Nepal? Explain them.
4. What are the major objectives for establishing the nursery in mega projects? Describe the different criteria for the establishment of nursery for a highway project in lesser Himalaya zone of Nepal?
5. Fill in the blank boxes given below:

S.N	Structures	Functions	Applications	Advantages	limitations
1	Revetment wall				
2	Stone pitching				
3	Check dams				
4	cascade				

6. Mention at least 4 different differences between horizontal and vertical line of grass planation with figures.
7. Describe about the functions, installation process and limitations of turfing and brush layering.
8. After 6 years of tree plantation, it was found that following root system was developed. Calculate amount of increase in shear strength, if angle of internal friction of slope material is 24 degree and root were observed in C/S of 3 m².

No. of roots	Dia. of roots (cm)	Tensile strength of root fiber (MPa)	Angle of shear distortion in shear zone
14	10	13	22
17	11	22	19
14	14	15	21
22	09	16	24

9. Explain how the civil engineering structures interacts with the vegetative structures in respects to time and relative shear strength. Draw different graphs for different interacting structures.
10. Write short notes on: (any two)
 - a. Effect of vegetation on factor of safety on a slope
 - b. Land slide mapping
 - c. Palisade
 - d. Application of bioengineering

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1. What is Bio-Engineering? What are the advantages and limitations of Bio-engineering?
2. Write down the causes and Mechanisms of Landslide. Enlist the steps for preliminary and detail landslide mapping in site.
3. What are the major component parts of a landslide? How can the slope failures be categorized based on the effectiveness of bioengineering applications?
4. Define Nursery. What are the factors that have to be considered while establishing a nursery?
5. A site has been treated with tree plantation with the root characteristics given as below. Estimate the increase in the shear strength of the slope materials by perpendicular root area method-if the angle of internal friction of the slope material is 25° and the area of root coverage is 2m^2 .

Dia or roots, mm	No. of roots	Tensile strength of root fibre, Mpa	Average Angle of shear distortion in the shear zone
7	10	20	17
11	20	10	18
15	18	18	15
19	24	12	22

6. Define Small Scale Civil engineering system. How they are interacting with vegetative engineering system? Explain with examples.
7. What are the basic criteria for plant species selection in Bio-engineering? Explain the process of Final Choice of Plant Type.
8. Enlist different vegetative stabilization techniques which are commonly used in bio-engineering practice and write down the procedures for the construction of Fascines.
9. Describe how hydrological components effect on instability of slopes. List out the engineering functions of Plants.
10. Write short notes on: (Any two)
 - a) Maintenance activities in bio-engineering works
 - b) Basic Requirements of Plants
 - c) Plant propagation
 - d) Guidelines for applying the Bio-engineering works

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 - ✓ Attempt All questions.
 - ✓ All questions carry equal marks.
 - ✓ Assume suitable data if necessary.
1. Define bio-engineering. Briefly explain about the different functions and applications of bio-engineering.
 2. Explain about the mass movement and its classification indicating factor contributing to increase in shear stress.
 3. Define nursery. What are the main components of nursery? Explain about the factors to be considered to select the nursery site.
 4. Explain about the causes and mechanisms of slope failure during highway construction in Nepal.
 5. What are the different factors that govern the distribution of vegetation in Nepal?
 6. List out all the small civil engineering structures that are used in bio-engineering techniques. Explain about the different walls with their engineering functions.
 7. Write short notes on:
 - i) Relative strength of structures over time
 - ii) Plant ecology of Nepal
 - iii) Palisades and mulching
 - iv) Maintenance activities in bio-engineering works
 8. Check dams are simple physical constructions to prevent the down cutting of runoff water in gullies. Explain about the practical features of check dams.
 9. Differentiate between horizontal and vertical line of grass plantation with figure.
 10. After 6 years of tree plantation, it was found that following root system was developed. Calculate amount of increase in shear strength, if angle of internal friction of slope material is 25 degree and root were observed in C/S of 2 m².

No. of roots	Dia. of roots (cm)	Tensile strength of root fiber (MPa)	Angle of shear distortion in shear zone
10	8	12	15
20	5	20	18
18	9	10	20
24	6	18	22

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1. Describe scope and fields of application of bio-engineering. [8]
2. How slope stability is analyzed with different aspect? Explain any one in brief. [8]
3. What do you mean by plant community? How plant community helps for the switching of bio-engineering practice? [8]
4. What is the cause of failure? Draw typical landslide map showing all components. [8]
5. Describe how soil strength and stability analysis is important for vegetation. [8]
6. What is drought factor? Describe plant species selection based on drought factor. [8]
7. List out small scale civil engineering structures use in bio-engineering. Describe functional use of retaining wall in bio-engineering. [8]
8. Explain any three vegetative stabilization techniques with major function and design criteria. [8]
9. Define bio-engineering nursery. What are the factors that must be considered when establishing a nursery? [8]
10. Write short notes on: (any two) [4×2]
 - i) Optimal technique
 - ii) Engineering function of plant
 - iii) Basic requirement of plant

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1. Define bio-Engineering. Briefly explain about the different functions and applications of bio-Engineering.
2. Explain about the mass movement and its classification indicating factor contributing to increase in shear stress.
3. Define nursery. What are the main components of nursery? Explain about the factors to be considered to select the nursery site.
4. Explain about the causes and mechanisms of slope failure during highway construction in Nepal.
5. List out the basic sixteen steps of landslide mapping technique that are used in Nepal.
6. What are the different purposes of cuttings that are used in vegetative systems of bio-engineering?
7. What are the different factors that govern the distribution of vegetation in Nepal?
8. List out all the small civil engineering structures that are used in bio-engineering techniques. Explain about the different walls with their engineering functions.
9. Write short notes on: (Any two)
 - a) Relative strength of structures over time
 - b) Plant ecology of Nepal
 - c) Palisades and mulching
10. After 6 years of tree plantation, it was found that following root system was developed. Calculate amount of increase in shear strength, if angle of internal friction of slope material is 30 degree and root were observed in C/S of 4m².

No. of roots	Dia. of roots (cm)	Tensile strength of root fiber (MPa)	Angle of shear distortion in shear zone
10	8	12	15
20	5	20	18
18	9	10	20
24	6	18	22
