Mid-West University

Examinations Management Office

End Semester Examinations 2081

Master level/ M. Sc. (Structural Engineering)/ 3rd Semester — Full Marks: 60

Time: 3 hours — Pass Marks: 30

Subject: Tunnel Engineering (ELE543)

- *Attempt all the questions.*
- *Figures in the margin indicate full marks.*
- *Assume suitable values, with a stipulation, if necessary.*
- *Candidates are required to answer the questions in their own words as far as possible.*

1. What are the factors that bring about changes in stress and deformation in an underground excavation? Describe the measures that are taken to reduce the stability problems associated with induced stresses. **(10)**
2. What are the major functions of bolt? What is the difference between active and passive bolts? Describe how bolts are used to support **(10)**
   a) Suspended Ground
   b) Support Bed Ground
3. Considering Nepal's complex and varied geology, what are the main geotechnical challenges encountered in tunnel engineering projects in Nepal? How can these challenges be mitigated during the planning and construction phases? Also briefly write about various investigations during entire tunneling process. **(10)**
4. Explain the guideline for the selection of primary support system for a) soil tunnels and b) rock tunnels. Describe various problems anticipated with tunneling in hard rocks and soft soils. **(5+5)**
5. Explain the process of shotcreting in tunneling. How does shotcreting differ from traditional concrete application methods, and why is it preferred in tunnel construction? Compare wet-mix and dry-mix shotcrete, highlighting their advantages and disadvantages. **(10)**
6. Describe the types of explosives commonly used in tunneling. How do the properties of these explosives influence the choice of drilling and blasting techniques? What are the key factors to consider when designing a blasting pattern for tunneling? Discuss how rock type, tunnel size, and surrounding conditions influence the design. **(10)**

The End