KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Marks Scored:

Level : B.E.
Year : IV

Course : CIEG 408
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date 11 MAR 2019

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Choose the most appropriate answer.

1. The rock mass quality knowledge is highest during
   a. Feasibility Study
   b. Detailed design
   c. Principal design
   d. Construction

2. The angle between practical and theoretical tunnel profile is called
   a. Friction angle
   b. Lookout angle
   c. Excavation angle
   d. Shear angle

3. Generally, the diameter of cut holes are
   a. less than 38 mm b. 38-51 mm c. 41-58 mm d. larger than 51 mm

4. The process of removing loose rocks from walls and surfaces after blasting is called
   a. Scaling
   b. Scraping
   c. Barring
   d. Levelling

5. Which of the following gives very detailed information of rock mass conditions?
   a. Core Drilling
   b. Electrical Resistivity Tomography
   c. Exploration Adit
   d. Ground Penetrating Radar

6. What is the purpose of ventilation during tunnel construction phase
   a. Supply fresh air to a fire in tunnel
   b. Remove toxic gases
   c. Not necessary for short tunnel, less than 1 km
   d. Easier operation of mucking operation

7. What is used for inclined excavation of tunnel?
   a. Raise Climber
   b. Boring Machine
   c. Alimak
   d. Pneumatic Rock Drill

8. For poor rock, the Q value will be between
   a. 0.01-0.1 b. 1-4 c. 0.1-1 d. 4-10

9. The rock mass number is obtained by
   a. Rating for RQD = 1 in RMR system
   b. Rating for Discontinuity Spacing = 1 in RMR
   c. SRF = 1 in Q-system
   d. RQD = 1 in Q-system

10. In Q-system, RQD/J_n is expressed as
    a. Joint Blocks
    b. Structure of Rock Mass
    c. Strength of Block Surface
    d. Stress free factor

11. The ESR value for hydropower tunnel lies between
    a. 2-5
    b. 1.2-1.3
    c. 1.6-2
    d. 0.9-1.1

12. In dry mix
    a. Cement and sand are dry mixed and water is added at the nozzle
    b. Cement, sand and water are mixed
    c. Sand and water are mixed and cement is added at the nozzle
    d. Cement and water are mixed and sand is added at the nozzle

13. Which of the following does not provide any information on the estimation of tunnel support
    a. Q-System
    b. Rock Mass Rating
    c. Geological Strength Index
    d. RMi

14. The common dimension for blast hole for tunneling is
    a. 25-30 mm
    b. 50-75 mm
    c. 45-50 mm
    d. 75-100 mm

15. Delphi Technique is a technique to
    a. Identify Risk
    b. Decide Mitigating Majors
    c. Access Probability and Consequences
    d. HSE Plan

16. During face advance of tunnel elastic deformation starts about
    a. Six diameter of tunnel
    b. Two diameter, one diameter
    c. diameter, two diameter
    d. Two diameter of tunnel

17. Estimated tunneling cost including medium rock support for a per sq.m
    a. NRs. 2,00,000.00
    b. NRs. 50,00,000.00
    c. NRs. 5,00,000.00
    d. NRs. 1,00,00,000.00

18. In your tunnel you expect some heavy water leakage through a fault zone. Which would be your best choice to reduce the problem?
    a. Surface/Post-grouting
    b. Spiling
    c. Pregrouting
    d. Presplitting

19. In drill and blast method of tunneling, cut holes are
    a. always loaded
    b. large diameter holes
    c. unloaded
    d. deep holes

20. During core drilling, the length of core pieces were obtained as 9cm, 17cm, 30cm, 25cm, 10cm and 35cm. the total length of the core was 200cm, so the RQD value is
    a. 63 %
    b. 54 %
    c. 59 %
    d. 85 %

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SECTION "B"

Attempt *ALL* questions.

1. A new road tunnel from Naubise to Kathmandu is planned to shorten the road to reach Kathmandu Valley. As you are the in-charge of the project, which type of tunnel excavation would you prefer and describe it in details and also discuss the main purpose of the excavation method. [6+2]

2. A hydropower tunnel of 16 sq. m is under construction and passes through extremely poor rock masses. A 100 m long shear zone is encountered and you have two choices for rock support of either full concrete-lining or reinforced shotcrete ribs. What is your choice and why? [6+2]

3. Develop the Health safety and Environment plan for a hydropower tunnel located to the lesser Himalayan region of Nepal. [6]

4. Describe the different types of rock mass classification approaches to estimate the tunnel support in weak rock mass conditions in the Himalayan region of Nepal. [6]

5. What are the different types of stability problems of underground structures in the Nepal Himalaya? Describe various rock support techniques for weak rock conditions, Q value varying between 0.005-2, tunnel section 4 m high, 3 m wide. [4+4]

6. Describe the various terminology used in the underground structures with neat sketches. [4]