Register No.:   ....   Name: ....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

THIRD SEMESTER M.TECH DEGREE EXAMINATION (Regular), FEBRUARY 2022
CIVIL ENGINEERING (GEOMECHANICS AND STRUCTURES)
(2020 Scheme)

Course Code :   20CEGST231

Course Name: Rock Mechanics

Max. Marks :   60   **Duration: 3 Hours**

PART A
(Answer all questions. Each question carries 3 marks)

1. What are the limitations of seismic method of rock exploration?
2. With the help of a neat sketch explain the difference between a syncline and an anticline.
3. Explain Maxwell rheological model.
4. Explain the mechanism of subsidence by collapse of underground openings.
5. Discuss the two fundamental pillar design approaches.
6. Explain the cracking, punching and wedging type of rock failure.
7. What are rock bolts? List the different types of rock bolts used for support.
8. Discuss briefly any two shapes of tunnels.

PART B
(Answer one full question from each module, each question carries 6 marks)

MODULE I

9. Explain the electrical resistivity method for rock exploration.   (6)

OR

10. Explain the strength test used to determine the bearing capacity of rocks.   (6)

MODULE II

11. Write a note on the effect of discontinuities on the strength of rock.   (6)

OR

12. Explain the behavior of rock under hydrostatic compression.   (6)

MODULE III

13. Triaxial tests were carried out on 54-mm-diameter (NX core) intact rock specimens. The applied confining pressures and the principal stress differences at failure are summarised below.

(6)

Confining pressure (MPa)	0	5.0	10.0	15.0	20.0	25.0
Principal stress difference (MPa)	59.5	87.5	116.0	139.5	167.5	192.5

Plot σ_1 against σ_3 at failure and determine the uniaxial compressive strength and the friction angle of the intact rock.

OR

14. Explain Griffith theory of brittle strength. (6)

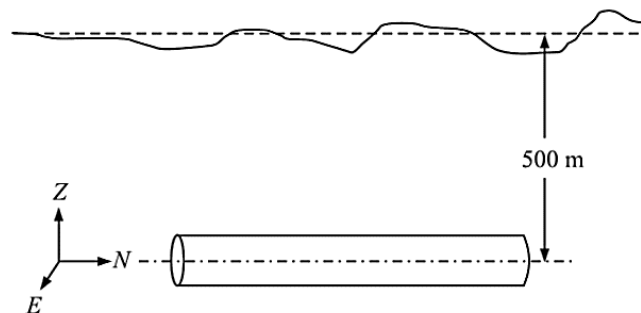## MODULE IV

15. A company is planning to excavate a 5 km long horizontal tunnel of 6 m diameter at a depth of 500 m from the ground surface as shown in the figure. The average unit weight of rock is 26 kN/m³. From the insitu stress measurements it was found that the direction of major horizontal stress is coinciding with the tunnel axis with a magnitude of 30 MPa whereas the minor horizontal stress is oriented along the E- axis with a magnitude of 15 MPa. Determine the stresses at the boundary of the tunnel when
    (i) $\theta = 0°$
    (ii) $\theta = 90°$ (6)

OR

16. Write a note on different rock supports needed to avoid plastic deformation. (6)

MODULE V

17. Explain the different types of foundations on rock. (6)

OR

18. Explain in detail the various foundation failures on rock with neat sketches. (6)

MODULE VI

19. Write a note on any 3 types of rock bolts? (6)

OR

20. Discuss the different problems associated with tunnels.   (6)

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