



CBCS SCHEME

18MN731

Seventh Semester B.E. Degree Examination, June/July 2023

Open Pit Slope Analysis and Design

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Determine the factor of safety of the sliding block on a single discontinuity plane with a neat sketch. (14 Marks)
- b. The slope surface is cohesionless and the friction coefficient for both planes are the same. The block is defined by the angle between two planes ($\xi = 55^\circ$), angle of inclination of bisection line ($\beta = 60^\circ$) and dip of bisection line ($\psi_i = 65^\circ$). The friction angle of the sliding surface is ($\phi = 50^\circ$). Calculate the factor of safety for a block sliding along the line of intersection. (06 Marks)

OR

- 2 a. Determine the critical depth of tension crack on the upper surface of the slope with a neat sketch considering the safety factor minimum. (12 Marks)
- b. A 12m high rock slope has been excavated at a face angle of 60° . The crack in which this cut has been made contains persistent bedding planes that dip at an angle of 35° into the excavation. The 4.35m deep tension crack is 4m behind the crest and is filled with water to a height of 3m above the sliding surface. The strength parameters of the sliding surface are as follow: Cohesion, $C = 25$ kPa and friction angle $\phi = 37^\circ$. The unit weight of the rock is 26 kN/m³, and the unit weight of the water is 9.81 kN/m³.
 - i) Calculate the factor of safety of slope for the above given condition.
 - ii) Determine the factor of safety if the slope were completely drained.
 - iii) Determine the factor of safety if the cohesion were to be reduced to zero due to excessive vibrations from nearby blasting operations, assuming that the slope was still completely drained. (08 Marks)

Module-2

- 3 Explain in detail the geotechnical data required for high wall slope stability studies with neat sketch. (20 Marks)

OR

- 4 Explain in detail the various parameters to be considered for geotechnical investigation of slope stability. (20 Marks)

Module-3

- 5 a. Explain in detail the laboratory tests performed to determine joint compressive strength by rebound hammer test with sketch. (10 Marks)
- b. Estimate joint shear strength of joint using Barton's and Choubey model for weathered rock samples assuming that the joint roughness coefficient = 7.1, joint wall compressive strength = 170.5 MPa, basic friction angle = 28.4° , Schmidt hammer rebound number on weathered fracture surfaces and dry unweathered surfaces are 20 and 40, upper block weight = 800 g, area = 170 cm², tilt angle = 50° . (10 Marks)

OR

- 6 a. Explain in detail the triaxial test performed to find shear strength of intact rock with neat sketch. (10 Marks)
- b. Find joint shear strength of joint using Barton's model assuming that the joint roughness coefficient = 5, joint compressive strength = 23 MPa, base friction angle = 32.05° , Schmidt hammer rebound number on weathered fracture surfaces and dry unweathered surfaces are 30 and 50, upper block weight = 837.5 g, area = 150 cm^2 , tilt angle = 48° . (10 Marks)

Module-4

- 7 a. Explain in detail with neat sketch the open standpipe piezometer used for monitoring water pressure with advantages and disadvantages. (10 Marks)
- b. An aquifer is 2045m wide and 28m tall. Its hydraulic conductivity is 145 m/day. Calculate the velocity of the groundwater as well as the amount of water that passes through the end of the aquifer if the porosity of the aquifer is 32%. (10 Marks)

OR

- 8 a. Explain in detail the pneumatic piezometer used for monitoring water pressure with advantages and disadvantages with neat sketch. (10 Marks)
- b. Draw a groundwater flow net of an open pit slope in rainy season. What purpose does it serves? (05 Marks)
- c. Determine equivalent permeability of a planner array of parallel smooth cracks for the following data where $e = 0.1 \text{ cm}$, $b = 100\text{cm}$. (05 Marks)

Module-5

- 9 Explain in detail the deformation approach for analysis of slope stability. (20 Marks)

OR

- 10 Explain :
- i) Ordinary method of slices
 - ii) Janbu's simplified method
 - iii) Janbu's generalized method
 - iv) Bishop's simplified method
 - iv) Bishop's rigorous method
 - v) Sarma's method.
- (20 Marks)
