

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
M.Tech. Winter 2019 - 20 Examination

Semester: 3
Subject Code: 203215230
Subject Name: Stability analysis of slopes

Date: 26/11/2019
Time: 10.30 am To 1.00 pm.
Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

- Q.1** A) An embankment 15 m high is inclined at 30° to the horizontal. A stability analysis by the method of slices gives the following forces per running meter;
Sum of shearing forces = 500 kN
Sum of normal forces = 1000 kN (05)
Sum of neutral forces = 200 kN
The length of failure arc is 30m. The value of effective shear parameters is 25 kN/m^2 and 20° respectively. Determine the FOS of the slope.
B) Derive the equation to compute stability analysis of infinite slope for cohesionless soil. (05)
C) What are the causes of slope failure? (05)
- Q.2** Answer the following questions. (Attempt any three) (Each five mark) (15)
A) Explain face failure, toe failure and base failure.
B) Determine the FOS against sliding for the trial slip surface having angle of rotation of 75° . Take $c = 6 \text{ t/m}^2$, $\phi = 0^\circ$. The weight of wedge is 200 t and acts at a horizontal distance of 1 m from the vertical passing through centre. The radius of slip circle is 20 m.
C) Derive Laplace equation for 2 dimensional flows.
D) Describe the method to locate the centre of critical slip circle.
- Q.3** A) Explain Swedish Circle Method for $c-\phi$ soil. (07)
B) List the conditions under which stability of slopes of earth dam is tested and explain any one in detail. (08)
- OR** (08)
- B) What is the use of friction circle method?
- Q.4** A) Explain Bishop's method of slope stability in brief. (07)
- OR**
- A) A very long natural slope is inclined at 12° to the horizontal. Soil has following properties $c = 15 \text{ kN/m}^2$, $\phi = 25^\circ$ and $\gamma_{\text{sat}} = 21 \text{ kN/m}^3$. The water table is at the surface and seepage is taking place parallel to the surface, calculate the factor of safety. $Z = 4 \text{ m}$. (07)
- B) An earth dam made of a homogeneous material has the following data:
coefficient of permeability of dam material = $5 \times 10^{-4} \text{ cm/sec}$
level of top of dam = 200 m
level of deepest riverbed = 178 m
H.F.L of reservoir = 197.5 m (08)
width of the top of the dam = 4.5 m
Upstream Slope = 3:1
Downstream Slope = 2:1
Determine the phreatic line for this dam section.