CE 70 Engineering Geology

Fall 2019 Midterm Examination

Sitar

Answer Key

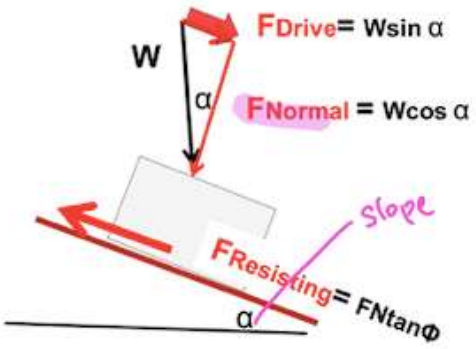
1. D
2. B
3. A
4. B
5. D
6. D
7. B
8. D
9. C
10. A
11. A
12. C
13. B
14. B
15. D
16. C
17. C
18. D
19. B
20. B
21. C
22. C
23. A
24. D
25. B
26. C
27. D
28. D
29. A
30. D
31. B
32. D
33. B
34. C
35. A
36. D
37. B
38. D
39. D

40. C
41. Describe the main characteristics of karst and give at least two environmental or engineering reasons why recognizing karst features is important.

    Answers will vary.

    Possible answer:
    Karst is an area made up of caverns and dissolute limestone. With those features, it makes the limestone surface very thin and weak, enough to collapse and create sinkholes, which are unpredictable and dangerous, so engineers need to account for that. Karst also has water that flows through it's rocks coming from an unknown source, and it flows so fast that it becomes a conduit for contaminants, which is also important to recognize.

42. Use a sliding block analogy to derive the equation for the factor of safety against sliding and used in slope stability analysis.



$F_{Normal} = F_N$
$F_{Resisting} = F_{fr}$
$W = mass * gravity = m * g$
$\alpha = angle\ of\ repose$
$\varphi = friction\ angle$
$\mu = coefficient\ of\ friction = tan\varphi$
$F_S = Factor\ of\ safety$

Y direction (Perpendicular to slope):
$F_N - m * g * cos\alpha = 0$
$F_N = m * g * cos\alpha$

From Physics:
$F_{fr} = \mu * F_N$
$F_{fr} = tan\varphi * m * g * cos\alpha$

X direction (parallel to slope):
$F_{Driving} = m * g * sin\alpha$

Factor of Safety:
$F_S = \frac{F_{fr}}{F_{Driving}} = \frac{tan\varphi * m * g * cos\alpha}{m * g * sin\alpha} = \frac{tan\varphi * cos\alpha}{sin\alpha} = tan\varphi * cot\alpha = \frac{tan\varphi}{tan\alpha}$

43. List at least 3 different types of discontinuities in rocks and explain how they might affect the slope stability of a rock mass.

    Answers will vary.

    Possible answer:
    Jointing: These natural cracks can crack even further under stress and cause structural failure
    Bedding
    Fractures

44. How does the shape of a river affect the velocity of flow?

    Answers will vary.

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Possible answer:
The velocity of flow depends on the cross-sectional shape of the river channel. If the cross-section looks more like a small U-shape, then it flows faster since there is less surface area and thus less friction for the water to travel. If the cross-section is more like a long rectangle, then the flow would be slower, since there is more surface area on the stream bed, and thus more friction, as the water travels. Also, given the same volume of water to pass through a cross section in the same amount of time, the smaller cross section would have to flow faster.