

Hydraulic Engineering: Flood Embankments & Hydraulic Structures.

Quick QUIZ, practice for exam.

1. In Figure 1 you see a first attempt to fit a Gumbel prediction over data. What do you need to do to improve the fit (μ =location; σ =scale parameter)?

- a) Increase μ and increase σ
- b) Increase μ and decrease σ
- c) Decrease μ and increase σ
- d) Decrease μ and decrease σ

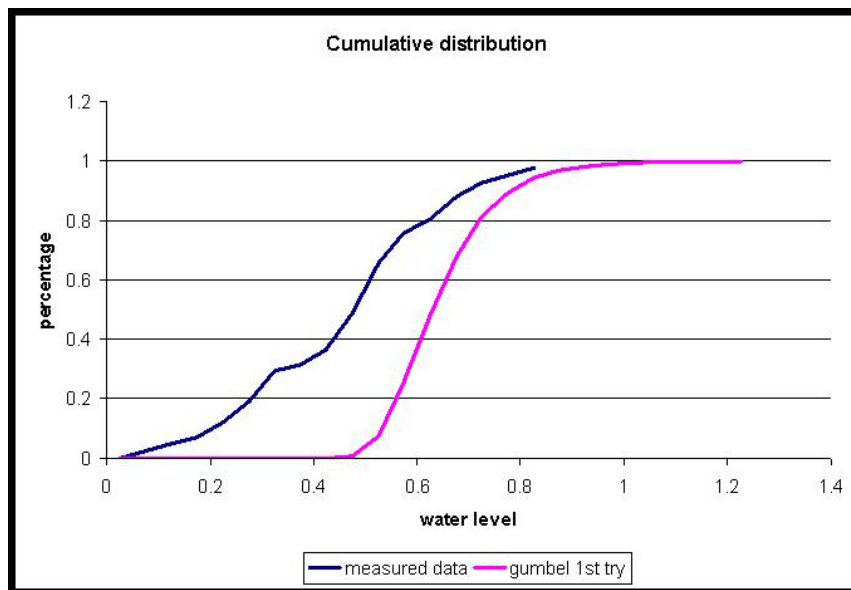


Figure 1. Question 1, initial attempt to fit Gumbel distribution

2. After applying Bishops method using D-Stability, the resulting safety factor $FS=1.18$. Given $\gamma_{mod} = 1.0$, $\gamma_{mat} = 1.1$, $\gamma_{dam}=1.2$. Is this dike safe?

- a) Yes, the new $FS = 1.18$
- b) Yes, the new $FS = 1.56$
- c) No, the new $FS = 0.98$
- d) No, the new $FS = 0.89$

3) What is the building height of a dike, given that $DWL = 9.4 \text{ m} + \text{NAP}$, $\text{Compaction} = 0.12 \text{ m}$, $\text{Overtopping height} = 0.17 \text{ m}$, $\text{local effects} = 0.1 \text{ m}$, $\text{SLR} = 0.61 \text{ m}$, $\text{robustness addition} = 0.3 \text{ m}$.

- a) 9.40 m
- b) 10.13 m+NAP
- c) 10.63 m
- d) 10.70 m+NAP

4) What is norm for a dike section for failure of grass erosion on inner slope (GEBK) given a maximum permissible flood probability of $1/3000$, assume $N=3$?

- a) $1/720$
- b) $1/12500$
- c) $1/37500$
- d) $1/112500$

- 5) Given the optimal slip circle for Bishop, what happens if you increase R ?
- FS increases, because the resisting moment increases and the driving moment decreases
 - FS increases**, because the resisting moment increases and the driving moment increases
 - FS decreases, because resisting moment decreases and the driving moment increases.
 - FS decreases, because resisting moment decreases and the driving moment decreases
- 6) What is the critical WL (H_{crit}) for piping using Bligh corrected for vertical outflow, given that $L=40$ m, $DWL=4m+NAP$, $h_p = -1m+NAP$, impermeable layer thickness=3m clay, aquifer: very fine sand.
- H_{crit} does not need to be computed, because there is no uplift
 - $H_{crit} = 2.2$ m
 - $H_{crit} = 3.1$ m**
 - $H_{crit} = 4.0$ m
- 7) Which of the following two statements is true for improving an unsafe dike?
- I: A less steep waterside slope of the dike may reduce the required crest height.
- II: The landward slope of a dike should be less steep if you construct a berm.
- Both I and II are true
 - I is true, II is false**
 - I is false, II is true
 - Both I and II are false
- 8) What is the amount of wave overtopping given that: $h_{cr}=1$ m, $H_s = 0.5$ m, $T_s = 3.5$ s, slope=1:3? Assume no corrections for berm, roughness, wall and wave angle.
- 2.2 l/m/s**
 - 4.1 l/m/s
 - 22 l/m/s
 - 410 l/m/s
- 9). A lock of 20m length (foundation on piles) is not safe against piping underneath. Given an outside water level of 5.4 m+NAP and an inside water level of 3.1 m+NAP (fine sand). what is approximately the total length of the required sheet piles?
- 4.0 m
 - 4.7 m
 - 8.1 m**
 - 16.1 m
- 10). A sluice to discharge water from a canal ($Q=40$ m³/s) into a lake needs to be designed. What is the required sluice opening. Assume discharge coefficient $\mu=C=0.85$ and a constant water level difference between canal and lake of 0.4 m.
- 13.7 m²
 - 14.3 m²
 - 16.8 m²**
 - 40 m²

- 11). Given the same sluice of the previous question, what would happen to the required sluice opening if you increase the water level in the canal?
- the required sluice opening stays the same
 - the required sluice opening will increase
 - the required sluice opening will decrease
 - there is not enough information to determine this
- 12). Given a probability of non-closing of $3e-4$ (P_{nc}) with an OKP that occurs once every ten years and a norm of 1/2000. Is this structure safe against non-closing and what is the estimated probability of failure due to non-closing ($P_{fa,nc}$)?
- Yes, $P_{fa,nc} = 3e-3$
 - Yes, $P_{fa,nc} = 3e-5$
 - No, $P_{fa,nc} = 3e-3$
 - No, $P_{fa,nc} = 3e-5$
- 13). What is the effect of a pile foundation at a lock on the risk of piping?
- Pile foundations do not affect piping
 - Pile foundations increase the risk of piping
 - Pile foundations decrease the risk of piping
 - This depends on the local circumstances
- 14). What is approximately the minimum required size and mass of the concrete cubes in the top layer of an impermeable rock revetment according to Hudson's equation given that $H_s = 3$ m, $T_s = 8$, slope = 1:3.
- size = 1 m, mass = 19 kN
 - size = 1m, mass = 2 tons
 - size = 1.5 m, mass = 77 kN
 - size = 1.5 m, mass = 8 tons
- 15). Compute the hydrodynamic force on the outer lock doors (per m width) given: $P_1=23$ kN/m²; $a_3 = 0.2$; door crest = 3.5 m+SWL; lock floor and bottom floor horizontal and both at 5m below SWL; with waves: $H_s=1.2$ m and $T_s = 3$ s.
- 11 kN/m
 - 110 kN/m
 - 1100 kN/m
 - 11000 kN/m
- 16). Compute the required crest height of the lock gates (in m+NAP) given that: total allowed overtopping/overflow = 0.43 m³/s/m; $H_s = 0.7$ m; SLR = 0.1m; DWL = 2.1 m+NAP. (assume a safety freeboard of 0.3m if $h_{cr} < 0.3$).
- 2.0 m+NAP
 - 2.3 m+NAP
 - 2.5 m+NAP
 - 2.9 m+NAP