# TD 603 Mid-semester Exam
2017
2 hours, 30 marks

You can bring one A4 sheet (both sides) with formulas etc. and a calculator. Please write your name and roll number on this sheet.

1. Visualize the terrain given by the topo-sheet below. Copy this in your answer book. Outline the stream, and the ridge-line in the sheet, which are known to exist. Draw the flowlines passing through p and q and and draw the watershed of the region S. Also mark the steepest areas and the flattest areas. [**6 marks**]
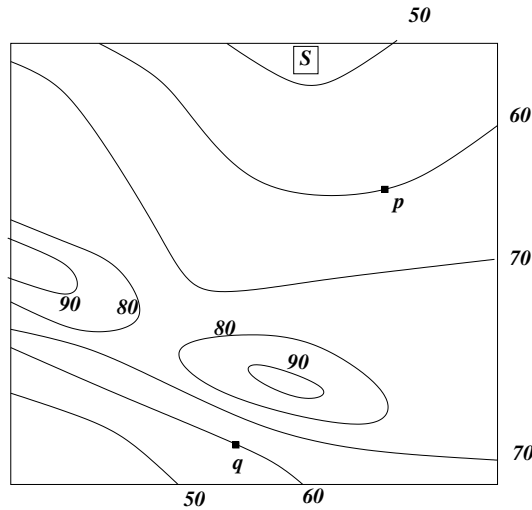
2. Consider a piece of land as shown in the figure. It is flat on the top, but there are two layers which meet at a slope. The top layer has a specific yield of 0.05 while the bottom has it as 0.02. The thickness is 50m. Suppose that the water table is x meters below ground level (mbgl). What is the amount of water $w(x)$ held by this plot of land (in thousand-cubic-meter)? Draw the graph.

If the water table is 30 meters below ground level and there is a rainfall of 100mm with an infiltration of 30%, what would be the rise in the water table? [**6 marks**]
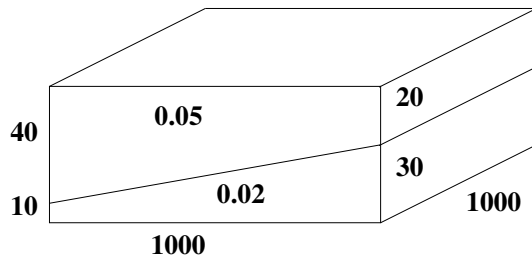
3. Let us look at Konambe area and the Devnadi watershed from the perspective of water balance. Suppose we have the following time line.

   - 2000: Building of Konambe Dam.
   - 2002. Begining of canal-based agriculture.

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- 2005. Commissioning of 10-village drinking water scheme based on reservoir.
- 2010. Start of diversion-based irrigation.
- 2012. Begining of DBI based agriculture.

Given the above sequence of events, plot the movements of yearly stocks and flows, i.e., (i) run-off, (ii) ET load, (iii) GW recharge (iv) mean GW stock levels (v) mean surface water stock. Give proper explanation. [**6 marks**]

4. A farm operates by the following physical laws.

- The soil is 40cm thick with a specific yield of 20%. Thus there is a capacity of 80mm of soil moisture.
- The infiltration is 50% of rainfall, only if the soil moisture can take it. All excess water goes as run-off. That is, 50% or more of the falling rainwater is run-off, depending on existing soil-moisture.
- The daily ET is 5mm or less, what ever is available in soil moisture.
- Next, the soil moisture recharges GW by 5mm if it is available, after the ET load is taken care of.
- It takes 10 days for this water to join groundwater.
- If the soil moisture is unable to meet ET load for one day, the next day, the farmer adds 40mm of soil moisture through irrigation from a well.

At the start of the season, soil moisture is at 50%, i.e., 40mm, and the water table (WT) is 10m below ground level (mbgl), with $S_y = 2\%$. Then we have the following rainfall. Fill the remaining parts of the table. Add more rows if required. [**12 marks**]

Day	1	2	3	4	5	5	7	8	9	10	11	12	13	14
Rainfall (mm)	30	30	150	0	0	0	0	0	0	0	0	0	0	0
Runoff (mm)														
ET(mm)														
Recharge (mm)														
Runoff (mm)														
Irrigation (mm)														
WT(mbgl)														