**Course: GW Flow and Contaminant Transport Modeling - Exam #3.**

*Before starting the exam please to sign the statement sent you before. Your exam is invalid if the statement is not accepted and signed by you.*

**Variant A**

An underground parking of the shape and size charted on the attached map is built with impermeable walls into a sandy layer (Kh = 2.5 m/d, Kv = 0.2 m/d, n0 = 10%, Sy = 9%, Ss=0,0001 1/m). The bottom of the sandy layer is at 12 m depth, and the underlying formation is impermeable. The GW level at the site is approx. 2 m from the surface and has a hydraulic gradient of 2.5 m/km from W to E.

* Task 1. Basic level: Building a steady state GW flow model of the system running without error. Results needed: saved plots of head distribution and drawdown (GW level changes) distribution, and pathlines from user defined upgradient points to downgradient points.

There is a set of two wells installed at the locations W1 (5057; 1054) and W2 (5057; 1038) with a continuous pumping rate of 50 m3/d. Please consider 50 mm/year recharge from precipitation.

* Task 2. Elevated basic level: Building a steady state GW flow model of the system running without error. Results needed: saved plots of head distribution and drawdown (GW level changes) distribution, and pathlines from user defined upgradient points to downgradient points.

There is a drain installed around the concrete structures to keep the GW level at 4 m. Please to install the drain using any kind of tool and determine the head distribution and GW level changes (increasing and decreasing heads)

* Task 3. Advanced level: Building a steady state GW flow model of the system running without error. Determination of the production rate of the drain with and without the wells installed. Results needed: saved plots of head distribution, production rates in the two different conditions
* Task 4. Master level: Build a transient model of the wells and drain for 30 days period. The drain starts to operate immediately and operates continuously but the wells are operating during the period between 8th noon and 20th day noon. Add monitoring wells to the locations: O1 (5061, 15024), O2 (5050, 15018), O3 (5051, 15054), O4 (5057, 15045), O5 (4998, 15030), O6 (5025, 15061), O7 (5026, 14998). Please to determine the water level fluctuations in the monitoring wells!



The site map is provided in file map1.dxf, the locations of the wells and observation wells are saved into well.dat and owell.dat, respectively.

You may solve the task on different levels, please note that to pass the exam an errorless model run at any level is required! All not above mentioned data can be chosen freely. The model should be made into a separate directory.

The files should be sent back to processing.modflow@gmail.com, within **65 minutes from the sending of the task prescription**. In case the

 compressed files are too large to send in regular e-mail attachment you can use google-drive link. In this case you should send me back the URL of the link within 65 minutes. **The results to be presented and all files of the model directory** should be compressed into a file with the name *Date(yyyymmdd)\_#??variant\_NeptunCode.zip* (for example 2*0200510\_#01A\_ZFFSHM.zip*). To consult me during the exam please use Skype (gama-geo\_balage) or Google Meet (modflow@gmail.com).

The final grade is determined as follows: 50% on Exam results and 50% on HW quality.

Miskolc, May 10, 2020.