Kafr El-Sheikh University
Faculty of Engineering
Civil Engineering Dept.
Year : 4 th year Civil

Subject : sanitary engineering
Date :10-1-2017
Time allowed :3.0 hr
Final exam: 2 pages
Full mark : 85

Question (1) Use the following data to calculate the following :

a-The design flow of the existing plant

b-The fluidized depth of the filter media during backwashing.

- Total number of filters = 15 filters
- Dimensions of filters = 6.0 x 8.0 m
- Initial head losses through the media = 0.40 m
- The media characteristics, (L=0.70m , dp = 0.6 mm, ρ_p = 2650 kg/m^3 and e=0.40)
- The backwash velocity = 6 filtration rate.

15 marks

Question (2) Using the given data below, calculate the monthly amount of alum needed for WTP, the dimensions of the alum solution tank, design the rapid mix tank, the flocculation basin, the sedimentations basin (rectangular – circular),the clari-flocculator and calculate the volume and the volume and dimensions of the sludge accumulation zone,

- Design discharge	= 50000 m^3/day.
- Alum dose	= 35 mg/lit.
- Concentration of suspended solid in the raw water	= 150 mg/lit.
- Efficiency of sedimentation tanks	= 90 %
- Concentration of alum solution	= 10 %
- Specific gravity of alum solution and sludge	= 1.05 ton/m^3.
- Average *G* value	= 30 sec^{-1}.
- Camp number (*G* value* retention time)	= $GT = 4*10^4$.

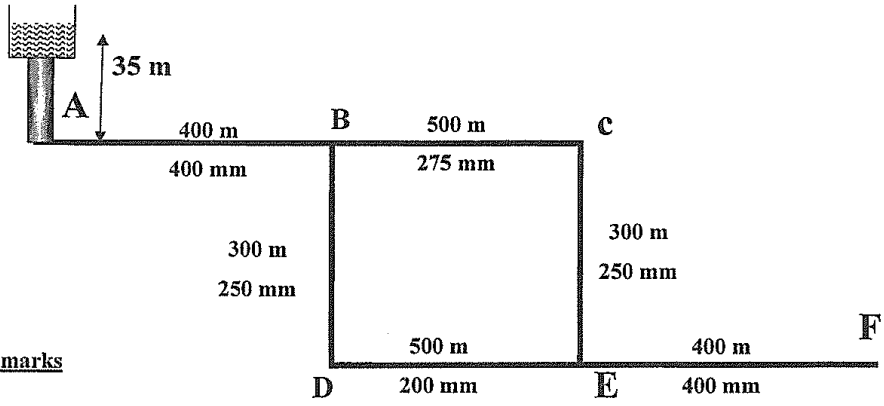
15 marks

Question (3) A circular sewer line with 0.25 m diameter is laid on slope 0.004 %. If "n" is equal 0.013 at all depth of water flow, estimate the following points,

a) Q and v when the sewer is flowing full.
b) Q and v when sewage depth of 0.15 m.
c) Q and v when the discharge in the sewer is at 0.7 of its capacity.
d) v and depth of flow when Q = 18 L/s.

15 marks

Question (4) Determine the head loss for a rapid sand filter with particles diameter of 0.4 mm at filtering velocity of 5 m/hr and specific gravity 2.65. the depth of the bed 0.67 m and the porosity is 0.4. then determine the backwash velocity if the expand depth 1.5 times the original depth by hydraulic backwash, Determine the excess flow (lit/sec) when the pressure at point F drops from 30 m to 25 m.



20 marks

Question (5) The raw wastewater has the follows,

Q_{des}= 50000 m^3/day & BOD_{in} $(S)_{in}$ = 650 mg/lit & X_u = 6000 mg/lit

a) Design an activated sludge aeration tank,
b) Check F/M ratio,
c) Estimate wasted volume and mass of daily sludge,
d) Design sludge thinker,
e) Design drying beds (t= 5.0 days)

20 marks

Best wishes
A. professor . Moharram Fouad