higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

WATER AND WASTE-WATER TREATMENT PRACTICE N2

31 JULY 2018

This marking guideline consists of 6 pages.

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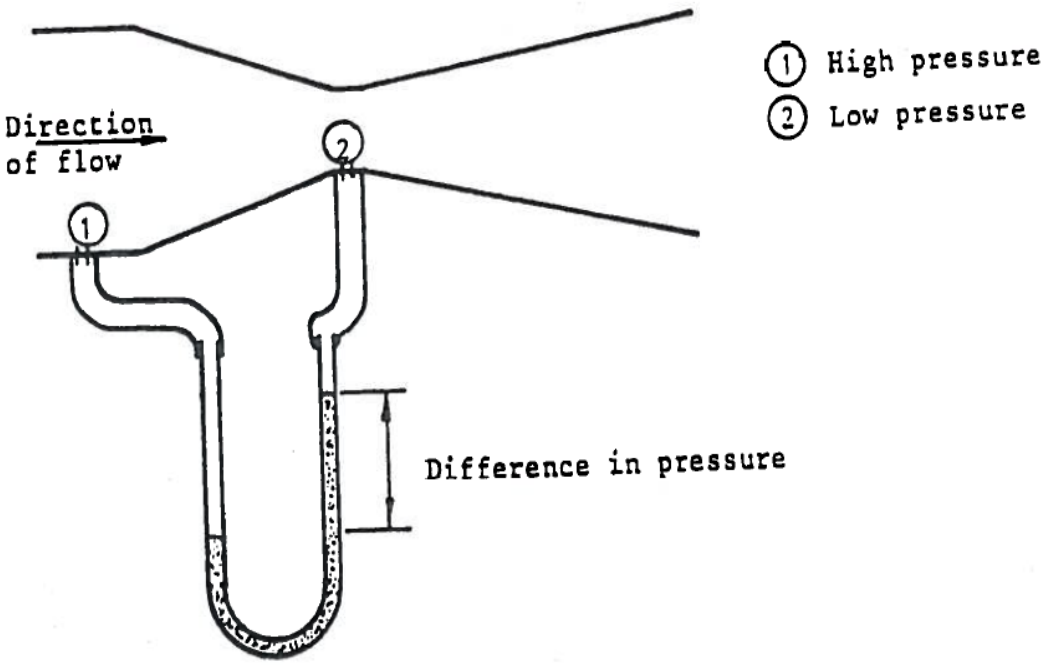
QUESTION 1

1.1 True
1.2 True
1.3 False
1.4 True
1.5 True

(5 × 1) **[5]**

QUESTION 2

2.1



(FOUR marks for labelling and ONE mark for diagram) (5)

2.2
- Flow is not obstructed
- No head loss
- No clogging
- Can handle sludge
- No small openings which can clog
- Measures flow in either direction
- Accurate over a wide range (Any 5 × 1) (5)

2.3
- 90° V-notch
- Rectangular
- Cipoletti (3)

2.4
- To treat the amount of water needed
- To be able to add the correct amount of chemicals
- To calculate retention times
- To determine unit costs
- To determine water losses through the plant (5)

2.5
- Lime
- Sodium carbonate (2)

[20]

QUESTION 3

3.1 3.1.1 Vp = A X L✓

$= \frac{\pi d^2}{4} \times L$✓

$= \frac{\pi(1.5^2)}{4} \times 2500$✓

= 4 417,865 m^3✓ (4)

3.1.2 Time to fill = $\frac{volume}{Pumpcapacity}$✓

$= \frac{4417,865}{0.15}$✓

= 29 452,433s✓✓

= 8,18 hours✓✓ (6)

3.2
- Activated sludge
- Trickling filters
- Rotating biological contractors
- Humus tanks
- Aeration
- Clarifiers (Any 5 × 1) (5)

3.3 Circular radial flow tanks are also called mechanical shallow tanks and are commonly used in South Africa. Flow takes place from a central inlet to a peripheral weir✓. The tank floor has a 7,5 to 15 degree slope from the side wall to the central sludge hopper✓. Sludge is withdrawn by a rotating bridge✓ with sludge scrapers which scrape sludge to the central hopper✓ from where it is usually automatically discharged. Scum scrapers also attached to the bridge remove scum to a trough slightly above TWL. ✓ (5)

[20]

QUESTION 4

4.1
- Aluminium sulphate
- Ferric chloride
- Lime
- Floccotan (4)

4.2
- Liquids
- Solids followed by solutionising
- Suspensions (3)

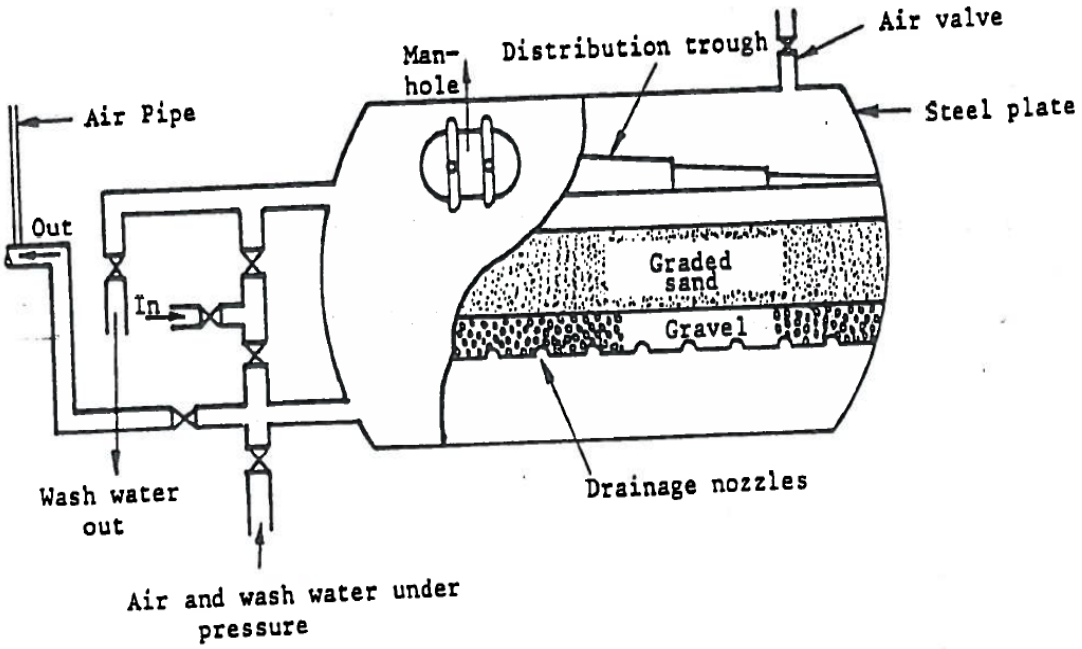
4.3 Clear water:✓ flows over effluent weir and goes to disinfection✓
Activated sludge:✓ pumped from the bottom and goes back to the reactor as the return activated sludge✓
Scum:✓ skimmed off the surface and also returns to the reactor with the returned activated sludge✓ (6)

4.4
- Size, shape and weight of the floc
- Temperature and thus the viscosity of the water
- Design of the inlet and the outlet works
- Average effective time available for sedimentation
- Effective depth of the tank
- Area of the tank
- Rate of overflow
- Rate of flow (Any 7 × 1) (7)

[20]

QUESTION 5

5.1



(NINE ticks for labellings and ONE mark for a diagram) (10)

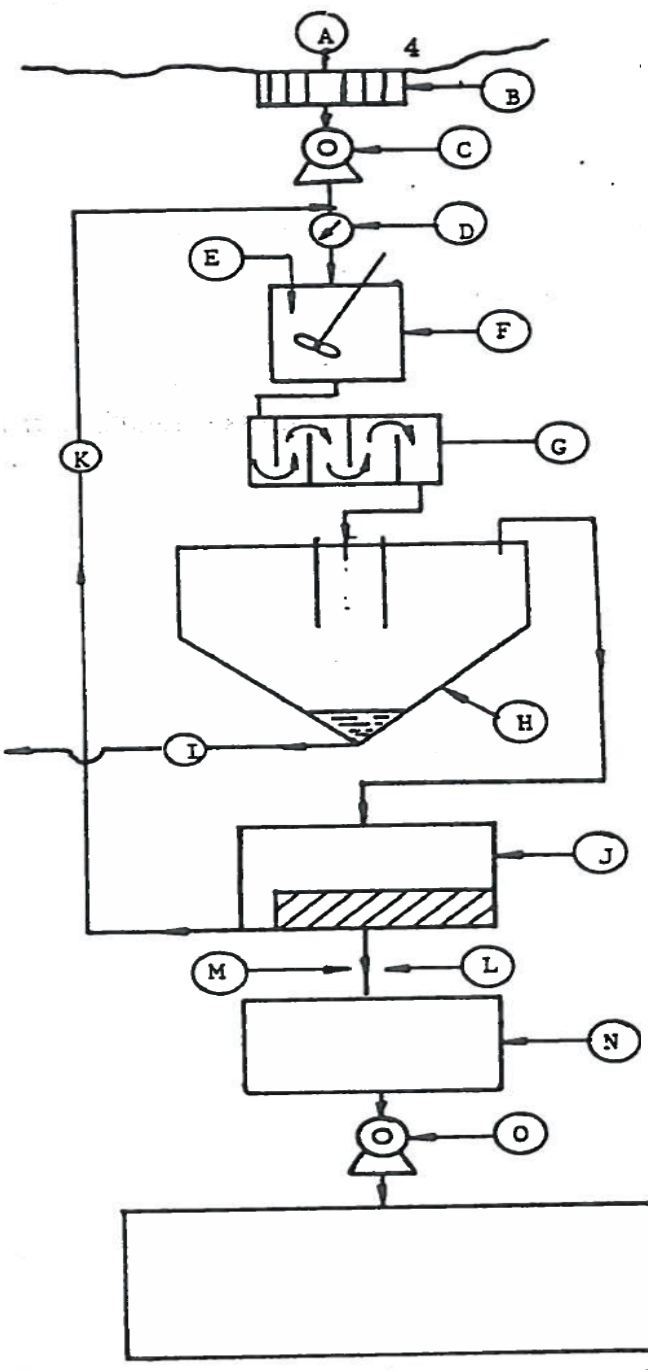
5.2 Filtration is a chemical and physical process✓ to clarify water by removing✓ suspended and colloidal particles from water✓ by passing it through a porous medium, normally sand.✓ (4)

5.3 5.3.1 Prechlorination is applied where tastes and odours are to be removed✓ and also for the control of algae.✓ It should not be applied when organic flocculants such as poly-electrolytes or floccotan are used.✓ (3)

5.3.2 Postchlorination involves the chlorination of the final purified water✓ to ensure it is disinfected and free from harmful bacteria.✓ This can be done at the treatment plant or at points along the distribution system such as reservoirs.✓ (3)
[20]

QUESTION 6

6.1



A – SOURCE
B – SCREEN
C – PUMP
D – FLOWMETER
E – FLOCCULANT
F – RAPID MIXING
G – FLOCCULATION
H – SEDIMENTATION
I – SLUDGE-TO-SLUDGE
J – SAND FILTER
K – SAND FILTER BACK-WASH WATER
L – CHLORINATION
M – pH CORRECTION
N – CLEAR-WATER RESERVOIR
O – PUMP
P – STORAGE RESERVIOR
Q – DISTRIBUTION

(Any 15 × 1) **[15]**

TOTAL: 100

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