

MAHARASHTRA JEEVAN PRADHIKARAN
MAHARASHTRA ENVIRONMENTAL ENGINEERING
TRAINING & RESEARCH ACADEMY, NASHIK
Professional Examination of Sub Divisional Officers/ Engineers
Assistant Engineer Grade – I

November – 2020

Subject :- Water supply Sanitation Engineering (Written)

Date :- 04/11/2020

Time:- 10.00 to 13.00

Marks :-75

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- Note :-
- 1) Question No.1 is compulsory & write any five questions from the remaining.
 - 2) Use of Calculator / Log table are allowed.
 - 3) Make suitable assumption If required. Assume Suitable data. Wherever necessary and state them clearly.
 - 4) Marks are reserved in each questions for neat sketches.
 - 5) Figure in bracket on the right side indicate full marks.
 - 6) Mobile, laptop & tablets are not allowed.
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Question No.1 :- For a village water supply scheme, study the data given below carefully and answer question a,b,c.

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|---|--------------|
| i) Design population of village | 10,200 souls |
| ii) Rate of water supply | 40 LPCD |
| iii) Hours of pumping | 16 Hrs |
| iv) Considering losses in the system
(15% for Dist. system 2% for Rising main) | 17% |
| v) Length of Rising main | 3200 m |
| vi) Ground level of supply well | 100m |
| Suction level of pump | 88 m |
| Bottom level of supply well | 86.5 M |
| Top level of supply well staining | 101.50 M |
| Lowest level on Rising Main at 500 m chainage | 97.0 M |

(1)

(2)

a) Draw a 'Flow Diagram' showing supply well, pumps, Switch room, rising main with Proper position of scour Valve, Reflux valve, air valve, ESR & stand post. (Show the levels properly) (5)

b) If the dia of Rising main is 150 mm DI K-9 Pipe and Frictional losses are 1.8 m /km. Calculate water hammer Pressure using following formula. (5)

$$a = \frac{1425}{\sqrt{1 + kd/Ec}}$$

K = Bulk modulus of water $2.07 \times 10^8 \text{ kg/m}^2$

D = dia of pipe in meter

C = Wall thickness of pipe in m.

(For DI K9 pipe, wall thickness = 6.3 mm)

E = Modules of elasticity of D.I pipe

$$= 1.7 \times 10^{10} \text{ kg/m}^2$$

Hmax = a.v.

V= velocity in m/s

(C) Calculate the H.P of pump (submersible pump) are to be provided. Also mention How many air valves will you provide in above Rising main. (5)

Question No.2:- Write short notes on any four of the following (12)

- Hardness of water
- Water hammer control
- Break point chlorination
- Drop manhole
- Orthotolidine test

Question No.3:- a) Explain in detail "Jal Jeevan Mission" (6)

b) Write in brief (Any two) (6)

i) Oxidation Pond

ii) M.B.R.

(3)

iii) Coagulation

iv) BOD

v) Air Valve

Question No.4:- A) Design a septic tank for small colony having population 200 souls. (7)

Rate of water supply - 135 liter/capita/day

Desludging period - 2 Years

Rate of sludge deposit - 30 Lit/Capita/Year

Quantity of sewage produce - 80 % water supply

Detention period of sewage - 24 hours

Work out size of septic tank with net sketch (Assure L:B =2.1)

Question No.4:- B) Write notes (Any One) (5)

i) Total solids and suspended solids.

ii) Biochemical oxygen demand.

Question No.5:- Draw neat and labeled sketch of the following (Any Three)

(12)

a) Septic tank for household

b) Water supply connection to house hold from 90 mm dia PVC distribution pipe.

c) Details of perforated pipe under drain below the filter sand bed.

d) Sketch of aqua privy.

e) Surface water intake arrangement with channeling in a river bed during scarcity in summer season.

Question No.6:- Distinguish between (Any three) (12)

a) Aerobic & anaerobic bacteria

b) Rapid sand filter & slow sand filter

(4)

- c) Self cleansing velocity & non scouring velocity
- d) Sullage & Sewage
- e) Surface source & underground source

Question No.7:- Answer the following (Any Three) (12)

- A) State the factors affecting consumptions of water
- B) Advantage and disadvantage of domestic consumer meters.
- C) Write in brief about precautions while sampling from taps during water sampling for bacteriological analysis
- D) List out the functions/ duties necessary for good management of a water supply system.

Question No.8:- Explain in brief (Any Three) (12)

- a) Different systems of distribution network depending upon their layout & direction of supply
- b) Importance of ferrule in domestic connection of water supply system.
- c) Different types of valves required to be used in water supply scheme
- d) Different methods of forecasting design population in rural water supply scheme & what do you understand by floating population.

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