

June 2018

ENVIRONMENTAL ENGINEERING*Time Allowed: 3 Hours**Full Marks: 70*

Answer to Question No.1 is compulsory and to be answered first.
This answer is to be made in separate loose script(s) provided for the purpose.
Maximum time allowed is 45 minutes, after which the loose answer scripts will be collected and fresh answer scripts for answering the remaining part of the question will be provided.
On early submission of answer scripts of Question No.1, a student will get the remaining script earlier.

Answer any five questions from the rest.

1. A. Choose the correct one from alternatives (any ten): 1x10
- i) Which one of the following practices causes reduction in per capita water consumption – a) Good quality water, b) Hotter climate, c) Modern living, d) Metering system.
 - ii) The multiplying factor, as applied to obtain the maximum daily water demand, in relation to the average i.e. per capita daily demand – a) 1.5, b) 1.8, c) 2.0, d) 2.7.
 - iii) The growth of population can be conveniently represented by a curve, which is amenable to mathematical solution. The type of this curve is – a) Semi log curve, b) Straight line curve, c) Logistic curve, d) Exponential curve.
 - iv) Which source of water, among the following, is not a sub-surface source – a) Spring, b) Well, c) Storage reservoir, d) Infiltration gallery.
 - v) The valve which allows the flow only in one direction, is a – a) Reflux valve, b) Sluice valve, c) Gate valve, d) None of these.
 - vi) “Safe Water” is one which does not contain – a) Pathogenic bacteria, b) Turbidity, c) Any taste, d) Any colour.
 - vii) A water having pH equal to 7 is – a) acidic, b) alkaline, c) neutral, d) none of them.
 - viii) The liquid wastes originating from residential and industrial buildings are collectively called – a) domestic sewage, b) combined sewage, c) sanitary sewage, d) none of them.
 - ix) Sewers are generally laid, starting from their – a) Off take point, b) Out fall point, c) Midpoint, d) Any point along the alignment.
 - x) Testing of sewer pipes may involve – a) Water test, b) Mirror test, c) Ball test, d) all these tests.
 - xi) World environmental day is – a) 5th June, b) 5th April, c) 5th October, d) 5th December.
 - xii) Which one is not a particulate – a) Dust, b) Smoke, c) Mist, d) Alcohols.
- B. Answer the questions (any five): 1x10
- i) The appropriate percentage of water in sewage is _____.
 - ii) Activated carbon is used in water treatment for removing _____.

- iii) The suitable layout for a water supply distribution system, for a city of roads of rectangular pattern is _____.
- iv) The most significant gaseous air pollutant is _____.
- v) Depletion of ozone layer in the outer atmosphere is likely to increase the incidence of disease _____.
- vi) Electrostatic precipitators remove _____.
- vii) The most significant primary gaseous pollutant, found in vehicular emission is _____.

C. Write True / False for the statement (any five): 1x5

- i) The rate of sludge accumulation in a septic tank is generally of the order of 30 lit / person / day.
- ii) The pH of fresh sewage is usually < 7.
- iii) Pathogenic bacteria enter waste waters, primarily from industrial water.
- iv) Between BOD & COD, the greater of the two is COD.
- v) The detention period adopted for oxidation pond is of the order of 2-6 days.
- vi) A grit chamber, having higher detention period (about 3-4 times) is called Detritus tank.

2. a) What are the factors that affecting rate of water demand?
 b) Describe shortly the different methods of forecasting population. 3+7

3. a) A small town has the following population figure. What will be the projected population in the year 2021? Use Arithmetic increase method & incremental increase method.

Year	1931	1941	1951	1961	1971	1981	1991
Population	5609	6270	6790	7430	8015	8407	9011

b) What is ground water recharge? Why it is necessary? 6+1+3

4. Write short notes on the followings (any four): 2½x4
 (a) pH value of water, (b) Hardness of water, (c) Nitrogen content of water, (d) Socket & spigot joint, (e) Sedimentation with coagulation

5. a) What is chlorine demand? Discuss briefly various forms of application of chlorine.
 b) Chlorine usage in the treatment of 2500 m³/day is 9 kg/day. The residual chlorine after 10 minutes contact is 0.2mg/lit. Calculate the dosage in milligrams/litre and chlorine demand of the water. 2+5+3

6. Write short notes on the followings (any four): 2½x4
 (i) Reuse of domestic sewage, (ii) Testing of sewer lines, (iii) Drop manhole, (iv) ozone layer depletion, (v) Controlling of soil pollution

7. a) What is "self cleansing velocity" and "non scouring velocity"?
 b) Calculate the diameter and discharge of a circular sewer laid at a slope of 1 in 400 when it is running full, and with a velocity of 2.1 m/s. (consider n=0.012). 5+5

8. Write short notes on the followings (any two): 5x2
 i) BOD of sewage
 ii) Oxidation ditch
 iii) Skimming tank

9. a) Explain with neat sketches construction details & design consideration of septic tank. 7+3
b) Draw a layout plan for building sanitary fittings(Drainage plan) with normal conventions.
10. Write short notes on the followings (any two): 2x5
(a) Trickling filters, (b) Sludge digestion, (c) Screening
11. a) Discuss briefly with neat sketches construction and working process of Aqua privy type latrine.
b) What is EIA?
c) Discuss briefly various methods involves for treatment and disposal of solid waste. 4+2+4
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