KATHMANDU UNIVERSITY
End Semester Examination
August/September, 2017

Mark Scored:

Level : B. E.
Year : III

Course : CIEG 313
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : SEP 13 2017

SECTION "A"
[20 Q × 0.5 = 10 marks]

Choose the most appropriate answer among the given choices.

1. The means of access for inspection and cleaning of sewer line is known as
   a) inlet
   b) manhole
   c) drop manhole
   d) catch basin

2. If the sewage contains grease and fatty oils, these are removed in
   a) sedimentation tank
   b) detritus tank
   c) skimming tank
   d) grit chamber

3. Dissolved oxygen in stream is
   a) maximum at noon
   b) minimum at noon
   c) maximum at midnight
   d) same throughout the day

4. A sewer that receives the discharge of a number of house sewers is called
   a) house sewer b) lateral sewer c) sub main sewer d) intercepting sewer

5. For a country like Nepal, where rainfall is mainly confined to one season, the suitable sewerage system will be
   a) separate system
   b) combined system
   c) partially combined system
   d) partially separate system

6. If present in water, chlorination of water does not reduce the
   a) ammonia content
   b) BOD
   c) organic matter content
   d) dissolved oxygen content

7. The layout of water distribution system used in Kathmandu valley is
   a) ring system
   b) radial system
   c) dead end system
   d) grid iron system

8. The percentage of total quantity of water in the world that is saline is about
   a. 75 % b) 79 % c) 95 % d) 97 %

9. The specific gravity of sewage is
   a) slightly greater than 1
   b) slightly less than 1
   c) equal to 1
   d) much greater than 1

10. For boilers water to be used should preferably be
    a. soft b) potable c) hard d) moderately hard

11. Ground water is usually free from
    a) dissolved impurities
    b) both suspended and dissolved impurities
    c) suspended impurities
    d) neither suspended nor dissolved impurities

12. For cement concrete pipes with plain ends the joint commonly used is
    a) dresser coupling
    b) screwed socket joint
    c) victaulic coupling
    d) collar joint

13. The maximum hourly demand of water per head is ____ times annual average hourly demand of water per head.
    a) 1.50 b) 1.80 c) 2.70 d) 3.24

14. As compared to shallow wells, deep wells have
    a) more depth
    b) more discharge
    c) more depth and more discharge
    d) more depth but less discharge

15. In lime soda process
    a) lime reduces non-carbonate hardness and soda ash removes carbonate hardness
    b) lime reduces carbonate hardness and soda ash removes non-carbonate hardness
    c) only carbonate hardness is removed
    d) only non-carbonate hardness is removed

16. Which one of the following is correct?
    a) COD>BOD>TOC
    b) BOD>COD>TOC
    c) TOC>BOD>COD
    d) TOC>COD>BOD

17. Centrifugation of sludge acts as
    a) thickening process
    b) dewatering process
    c) both thickening and dewatering process
    d) conditioning process

18. MLSS is an index of
    a) Mass of microorganism
    b) Concentration of organic matter
    c) aeration period
    d) solid retention time

19. The amount of coagulant needed for coagulation of water increases with
    a) increase in turbidity as well as in temperature of water
    b) increase in turbidity but decrease in temperature of water
    c) decrease in turbidity as well as in temperature of water
    d) decrease in turbidity but increase in temperature of water

20. A water main with roughness coefficient of 130, supplies water to a town with discharge of 1.823 cumec. The pipe is 6 km long and difference in elevation between intake and town is 15 m. The size of main required is
    a. 980 mm b) 1057 mm c) 1089 mm d) 1098 mm

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Level : B.E.
Year : III
Time : 2 hrs. 30 mins.

Course : CIEG 313
Semester : II
F. M. : 40

SECTION " B"

[4 Q. × 5= 20 marks]

Attempt *ANY FOUR* questions. Assume suitable data where necessary.

1.
   a. What is meant by the term "per capita demand"? How is it estimated? [2]
   b. The population of the past three successive census of a city are as given below: [3]

Census year	1951	1971	1991
Population	40,000	1,60,000	2,80,000

   Determine the expected population of the city by Logistic method for the year 2021.

2.
   a. Define palatable water. What are the requirements of wholesome water? [2]
   b. Which type of intake is generally used in hilly area of Nepal and why? Describe such intake with neat sketch. [3]

3.
   a. What are E-coli? Are they harmful to human beings? Why is their presence tested in water for drinking purpose? [2]
   b. The hardness of a water sample was found to be 300 mg/l as $CaCO_3$. The hardness was found due to Ca and Mg ions only. The concentrations of these ions are equal in water. The water analysis showed the concentration of HCO_3 was 150 mg/l. Calculate (i) the concentrations of Ca and Mg ions (ii) alkalinity of water and (iii) carbonate hardness and non-carbonate hardness of water. [3]

4.
   a. Explain flanged joint with neat sketch. [1]
   b. An old tank having dimensions of 11 m X 5 m X 3 m is available in a village. It is proposed to use as a settling tank. At least 93 % of particles having diameter of 0.025 mm, specific gravity 2.65 is expected to remove on the tank at 20° C. What will be an overflow rate on using that tank? Are tank dimensions enough to remove 99 % of particles having diameter 0.05mm at same conditions? [4]

5. A newly established town with a population of 1.2 million is to be supplied with water daily at 45 liters per capita. Water has to be stored also for fire demand keeping at least 2 % of total demand. The variation in demand is as follows: [5]

Time	Consumption %
5-7	25
7-12	35
12-17	20
17-19	20
19-5	0

Determine analytically the balancing reservoir capacity assuming pumping to be done at uniform rate and the period of pumping is 5 A.M to 10 A.M and 5 P.M to 8 P.M in two shifts.

SECTION "C"

[4Q. × 5 = 20 marks]

Attempt *ANY FOUR* questions. Assume suitable data where necessary.

6.

a. For a waste water sample, 5 day BOD at 20° C is 375 mg/l and is 67 % of ultimate BOD, what will be the 2 day BOD at 35° C? [3]

b. Define BOD and COD and explain their significance in wastewater examination. [2]

7.

a. What do you understand by a trickling filter? Explain with the help of neat sketches, the process involved in working of trickling filter. [3]

b. Compare the conventional and high rate trickling filter. Also list the key parameters which must be considered in design of a trickling filter. [2]

8.

a. Explain the necessity of providing drop manhole in sewer line with neat sketch. [2]

b. List the different types of storm water regulators used in a sewerage system. Explain any one in detail with neat sketch. [3]

9.

a. Define sludge. Why treatment of sludge is necessary? [2]

b. Which method of dewatering of sludge is suitable in context of Nepal? Explain it with neat sketch. [3]

10. A wastewater treatment plant disposes off its effluents into a stream at a point A. Characteristics of the stream at a location upstream of point A and of the effluent are as follows: [5]

Items	Effluent	Stream
Flow rate, m^3/s	0.35	0.60
DO, mg/l	2	7
Temperature, °C	29	22
BOD5 at 20° C, mg/l	155	2

Assume that the deoxygenation constant at 20° C (base e) = 0.20 per day and the reaeration constant at 20° C (base e) = 0.35 per day. For the mixture, equilibrium concentration of dissolved oxygen for the freshwater is as follows:

Temperature, C	21	22	23	24	26	28
DO, mg/l	8.99	8.83	8.68	8.53	8.22	7.92

The velocity of stream downstream of the point A is 0.25 m/sec. Determine the critical oxygen deficit and its location.