

CE 3141
Environmental Engineering-I

Full Marks: 72

Time: 3 Hours

- N.B.:-
- (i) Answer SIX questions, taking THREE from each section
 - (ii) Figure in the margin indicates full marks
 - (iii) Use separate answer script for each section.
 - (iv) Assume reasonable value for any data not given.

SECTION-A

- Q.1(a) Discuss with sketches the different types of settling of particles in plain sedimentation. 4.00
- (b) Discuss the coagulation and flocculation process with chemical reactions. 4.00
- (c) Find out total hardness, carbonate hardness and non-carbonate hardness of the following data: Na = 20, K = 30, Ca = 6, Mg = 11, Sr = 2, Cl = 40, HCO₃ = 72 and SO₄ = 5 mg/l. 4.00
- Q.2(a) Explain the phenomena involve in filtration process. *→ Theory of filtration* 4.00
- (b) Discuss the disinfection with chlorination. 4.00
- (c) The amount of chlorine used to treat 50000 l of water per day is 8 kg. The residual chlorine after contact period of 10 minutes is found to be 0.2 mg/l. Calculate the dosage in mg/l and the chlorine demand of the water. 4.00
- Q.3(a) What is intake? Write down the important considerations for designing of an intake. 4.00
- (b) What are the criteria you will consider for the selection pressure pipe in water supply system? 4.00
- (c) Write down the effects of corrosion of water pipe. How can you control it? 4.00
- Q.4(a) Briefly discuss about the social factors that should be considered for the implementation of water supply project. 4.00
- (b) Why does community participation essential to make the project sustainable? 4.00
- (c) Design a strainer for 30 mm diameter tubewell to be operated by a No. 5 hand pump at the rate of 45 lpm. slot no. 10 strainer having a 50% open area is to be used. The entrance velocity should be around 0.01 m/sec. 4.00

SECTION-B

- Q.5(a) "Climate change and biodiversity loss should be tackled together" – Discuss the statement. 4.00
- (b) Explain briefly the essential elements of a water supply system for a city with the help of neat sketches. 4.00
- (c) Calculate the rain water available for a family having a roof area of 200 m² in the central region of Bangladesh, where rainfall intensity is 2 m/year and runoff coefficient is 0.75. 4.00
- Q.6(a) Enumerate the factors to be considered in planning and designing of a water supply system. 4.00
- (b) State the methods of making population estimation. Which method do you consider best for population estimation in Bangladesh. – Explain. 4.00
- (c) Predict the population for the years 1981 and 1991 from the following census figures of a city by two different methods. 4.00
- | Year | 1901 | 1911 | 1921 | 1931 | 1941 | 1951 | 1961 | 1971 |
|-----------------------|------|------|------|------|------|------|------|------|
| Population (thousand) | 60 | 65 | 68 | 72 | 79 | 89 | 97 | 120 |
- Q.7(a) What is the purpose of water distribution system? Enumerate the requirements of a good water distribution system. 4.00
- (b) Why pumps are used in water supply projects at various stages? 3.00
- (c) Design a pumping unit capable of lifting 5 mgd. of water from an intake well to the treatment plant against a static head of 60 ft; length of the suction main is 120 ft and that of rising main is 400 ft. The pump will work in two shifts of eight hours each. Assume velocity of flow is 6 fps, friction factor is 0.01 and efficiency is 75%. 5.00
- Q.8(a) What are the objectives of water well design? Draw the different components of water well. 4.00
- (b) With neat sketches, explain the working process of a slow sand filtration. 5.00
- (c) What is meant by sustainable development? Why is socio-economic analysis necessary in Water Sanitation program? 4.00

CE 3141
Environmental Engineering - I

Full Marks: 72

Time: 3 Hours

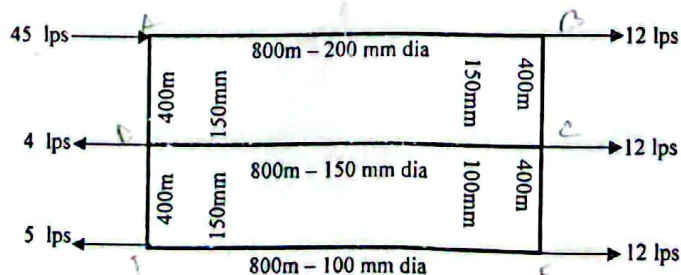
- N.B.:-**
- (i) Answer any **SIX** questions, taking **THREE** from each section.
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 - (iii) Use separate answer script for each section.
 - (iv) Assume reasonable value for any data missing.

SECTION-A

- Q.1** (a) Write down the consideration for designing and locating intake. 4.0
 (b) Discuss about the different types of intake based on source of surface water. 4.0
 (c) Design a pumping unit capable of lifting 5mgd of water from an intake well to the treatment plant against a static head of 60ft, length of suction main is 120ft and that of rising main is 400ft. The pump will work in two shifts of 8 hours each. Assume velocity of flow is 6fps, friction factor is 0.01 and efficiency is 75%. 4.0
- Q.2** (a) What is corrosion? Describe the causes of corrosion of metal pipe in water supply line. 4.0
 (b) What are the forces acting on pressure pipe in water supply system? Discuss elaborately. 4.0
 (c) A tube well having diameter of 20cm taps an artesian aquifer of thickness 25m. If drawdown is 4.5m with radius of zone of influence is 300m and permeability is 40m³/unit area per day, calculate the yield of tube well in liters per hour. What variation will take place for drawdown if zone of influence is restricted to 200m for two times of yield? 4.0
- Q.3** (a) Write down the necessity of community participation in development project. 4.0
 (b) Differentiate between women empowerment and gender issues. 4.0
 (c) A water treatment plant consumes ferrous sulphate (FeSO₄) and lime as coagulant at the rate of 10mg of FeSO₄ per liter of water. Find out the quantities of FeSO₄ and lime required to treat 9 million liters of water. 4.0
- Q.4** (a) Write down the principle of coagulation flocculation process. What are the factors that influence coagulation? 4.0
 (b) Discuss the theory of filtration. 4.0
 (c) Determine the clear water head loss in a filter bed that consists of two layers of filter media; a uniform anthracite layer of depth of 0.6m with an average particle size of 1.6mm and a specific gravity of 1.5; the other layer is composed of uniform sand 40cm deep with an average particle size of 0.6mm and the specific gravity of 2.0; for a rate of filtration of 150 l/m²/min. The operating temperature was found to be 15°C and the porosity is 0.35. Use Rose equation for evaluating the clear water head loss. 4.0

SECTION B

- Q.5** (a) What do you mean by fire demand? Describe a fire hydrant with neat sketch. 4.0
 (b) Draw a typical chlorination curve and explain the reaction zones. 4.0
 (c) Find out the settling velocity of spherical discrete particles 0.05mm in diameter having specific gravity of 2.6 and kinematic viscosity at 20°C of 1.003 × 10⁻⁶ m²/s. 4.0
- Q.6** (a) What are the permanent hardness and temporary hardness of water? Discuss the removal techniques of them. 4.5
 (b) Write down the Bangladesh Standard and WHO guidelines with respect to the following impurities: i) Hardness ii) Iron iii) Arsenic iv) TDS v) pH and vi) Color 3.0
 (c) Determine the unavoidable annual real losses of a water supply system of 2km water main having 3km underground connection pipe for 60,000 house connections. The average operating pressure is 20m. 4.5
- Q.7** (a) Deduce an expression for yield of a well for artesian aquifer. 3.5
 (b) Write short notes on i) Infiltration gallery (ii) Infiltration well (iii) Spring 4.5
 (c) Design a strainer for a 30mm diameter tubewell to be operated by a No.6 handpump at the rate of 25lpm. A slot No. 12 strainer having 50% open area is to be used. The entrance velocity should not exceed 0.015m/sec. 4.0
- Q.8** (a) Why is No.6 handpump tubewell the most popular in Bangladesh? Draw the sectional elevation of a No.6 handpump and level the different components of it. 4.0
 (b) Find out the approximate flow in the pipe network by using Hardy Cross method shown in figure below. 8.0



Heaven's Light is Our Guide
DEPARTMENT OF CIVIL ENGINEERING
RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering **THIRD** year **ODD SEMESTER** Examination, 2018

CE 3141
Environmental Engineering-I

Full Marks: 72

Time: 3 Hours

- N.B.:-**
- (i) Answer SIX questions, taking THREE from each section.
 - (ii) Figure in the margin indicates full marks.
 - (iii) Use separate answer script for each section.
 - (iv) Assume reasonable value for any data not given.

SECTION-A

- Q.1(a) What is intake? Write down the important considerations for design of an intake. 4.00
(b) Write down the desirable qualities of pressure pipe for water transportation from source. 4.00
(c) Discuss the different causes of corrosion of metal pipe. How corrosion can be controlled? 4.00
Explain.
- Q.2(a) Write down the general considerations for water distribution system. 4.00
(b) Explain the purposes of service reservoir in water supply system. 4.00
(c) Compare the contact times necessary to obtain 99.99% kill of bacteria in water under the following conditions: (i) free chlorine residual of 0.15 mg/l and $k = 1.1 \times 10^{-2}$ per second 4.00
(ii) combined chlorine residual of 2 mg/l with $k = 1.2 \times 10^{-5}$ per second.
- Q.3(a) Describe the Grid-iron method of layout of water distribution system with its advantages and disadvantages. 3.00
(b) Explain the different mechanisms involved in the filtration process. 3.00
(c) Write down the design consideration of rapid sand filter. 3.00
(d) A settling tank is designed to remove spherical particles of 0.80 mm diameter with specific gravity 1.20 at 22°C. Determine the removal of spherical discrete particles of 0.40 mm diameter with specific gravity 1.4 by this tank. Assume ideal settling conditions. 3.00
- Q.4(a) How does water become hard? Write down the various softening processes with their reactions. 4.00
(b) Discuss the Arsenic removal processes from groundwater. 4.00
(c) A water sample with p^H 9 and a caustic alkalinity of 90 mg/l, Bicarbonate alkalinity of 80 mg/l and a total hardness are formed by Ca, Mg, K, Na and Sr with 60, 50, 20, 105 and 45 mg/l, respectively. Find out total hardness, total alkalinity, carbonate hardness of non-carbonate hardness. 4.00

SECTION-B

- Q.5(a) What is unaccounted for water? How can you estimate the unavoidable annual real losses of water? 3.00
(b) Mention the controlling measures of water loss. 3.00
(c) Briefly discuss three leak detection methods. 3.00
(d) Write a short note on a solar still. 3.00
- Q.6(a) State the hydraulics of groundwater flow in wells. Deduce mathematical expressions for yield of artesian as well as ordinary wells. 4.00
(b) Explain the problems in groundwater development in Bangladesh. 4.00
(c) The diameter of a tube well is 50 cm. It is constructed in an aquifer of thickness 14m. The radius of circle of influence is 225m. Assuming permeability as 30 m^3 per unit area per day, calculate the drawdown when the yield of well is 1900 m^3 per day. 4.00
- Q.7(a) Briefly discuss the sanitation system in Bangladesh. 4.00
(b) Draw a clear diagram of a very shallow shrouded tubewell. Discuss the usefulness of SST and VSST under condition in the coastal areas of Bangladesh. 4.00
(c) A rapid sand filter is to be designed for a capacity of $27,000 \text{ m}^3/\text{day}$. What should be the number and size of the units? Calculate the percentage of filtered water required to wash the filter bed and the capacity of the wash water tank. Assume rate of filtration $5 \text{ m}^3/\text{hr}/\text{m}^2$, rate of washing: $35 \text{ m}^3/\text{hr}/\text{m}^2$, length of the filter run: 24 hrs. including 5 min. for filter washing and 10 min for resettlement of sand bed. 4.00
- Q.8(a) Discuss briefly the low cost alternative water supply technologies in Bangladesh. 5.00
(b) Discuss the advantages and disadvantages of rainwater collection system. 3.00
(c) Design a strainer for a 30 mm diameter tubewell to be operated by a No. 6 hand pump at the rate of 25 lpm. A slot No. 12 strainer having 50% open area to be used. The entrance velocity should not exceed 0.015 m/sec. 4.00

CE 31-11

Environmental Engineering - I

Full Marks: 72

Time: 3 Hours

- N.B.:-
- Answer any SIX questions, taking THREE from each section.
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 - Use separate answer script for each section.
 - Assume reasonable value for any data missing.

MNB

SECTION A

- Q.1(a) What is intake? Write down the considerations for design of an intake. 4.00
- Q.1(b) Write down the desirable quality of pressure pipes in water supply system. 4.00
- Q.1(c) Explain the causes of corrosion of metal pressure pipes. 4.00
- Q.2(a) Discuss the various forces acting on pipes for water supply. 4.00
- Q.2(b) Write down the principle of particle settling in water. Discuss the different types of settling in plain sedimentation process. 4.00
- Q.3 A settling tank is designed to remove spherical particles of 0.89 mm diameter with specific gravity 1.20 from the at 22°C. Determine the removal of spherical discrete particles of 0.40 mm diameter with specific gravity 1.2 by this tank. Assume ideal setting conditions. 4.00
- Q.3(a) Write down the principle of coagulation. Also write down the factors influencing coagulation and dosage of coagulants. 5.00
- Q.3(b) What is pressure filter? Write down the advantages and disadvantages of pressure filter. 3.00
- Q.3(c) Compare the contact times necessary to obtain 99.99% kill of bacteria in water under the following conditions: (i) Free chlorine residual of 0.15 mg/l and $k = 1.1 \times 10^{-5}$ per second. (ii) Combined chlorine residual of 2 mg/l with $k = 1.2 \times 10^{-5}$ per second. 4.00
- Q.4(a) Briefly discuss the various methods for the removal of Manganese from water. 4.50
- Q.4(b) What is the difference between unaccounted-for water and non-revenue water? 3.00
- Q.4(c) Write down the controlling measures of water losses. 4.50

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SECTION B

- Q.5(a) What is environmental engineering? Discuss the objectives of sanitation. 3.00
- Q.5(b) Enumerates and explain briefly the essential elements of a water supply system for a city with the help of neat sketches. 5.00
- Q.5(c) Enumerate the factors to be considered in planning a municipal water supply system. 4.00
- Q.6(a) What are the problems encountered in the operation and maintenance of PSE? 3.50
- Q.6(b) Discuss the usefulness of SST and VSST under conditions in the coastal area of Bangladesh. 4.50
- Q.7 Design a strainer for 38 mm diameter tubewell to be operated by a No. 6 handpump at the rate of 50 lpm slot no. 10 strainer having a 45% open area to be used. The entrance velocity should be around 0.01 m/sec. 4.00
- Q.8(a) Write short notes on (i) Infiltration galleries (ii) Springs (iii) Artesian wells. 4.50
- Q.8(b) Deduce mathematical expressions for yield of artesian as well as ordinary wells. 3.00
- Q.8(c) A 150 mm diameter tubewell produces 100 lps with a drawdown of 3 m and a circle of influence of 120 m in diameter. The static depth of water in the well is 40 m. Calculate the coefficient of permeability of the aquifer in which the tubewell is sunk. 4.50
- Q.9(a) Explain the problems in groundwater development in Bangladesh. 4.00
- Q.9(b) What is the potential for rainwater harvesting in Bangladesh? What are the advantages and disadvantages of rainwater harvesting in Bangladesh? 4.00
- Q.9(c) Calculate the rainwater available for a family having a roof area of 20 m² in the central region of Bangladesh, where rainfall intensity is 2.0 m per year. Assume a runoff coefficient of 0.75. 4.00

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Heaven's Light is Our Guide
DEPARTMENT OF CIVIL ENGINEERING
RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
 B.Sc. Engineering Third Year Fifth Semester Examination, 2015
CE-341
Environmental Engineering-I

Full marks: 70

Time: 3 Hours

- N.B. (i) Answer any **SIX** questions, taking **THREE** from each section.
 (ii) Figures in the margin indicate full marks.
 (iii) Use separate answer script for each section.
 (iv) Assume reasonable value for any data missing.

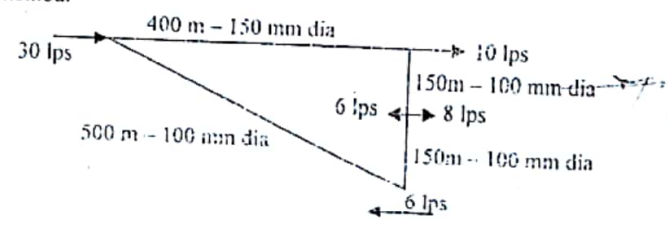
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SECTION-A

- Q.1(a) Discuss the role of safe water supply to the community to improve the sanitation facilities and health of community people. 4.00
 (b) Describe the activities that must be done in planning a municipal water supply system. 3.67
 (c) Design a coagulation sedimentation tank to treat 9 million litres of water per day. Make suitable assumptions where necessary. R(1.5) 4.00
 Q.2(a) What is corrosion of metal pipes? Discuss the important causes of corrosion of metal pressure pipe. 4.00
 (b) State the purpose of pumps and pumping machinery in water supply systems. Describe the pump based on service. 4.00
 (c) A settling tank is designed to remove spherical particles of 0.80 mm diameter with specific gravity 1.20 from the water at 22°C. Determine the removal of spherical discrete particles of 0.40 mm diameter with specific gravity 1.20 by this tank. Assume ideal settling conditions. 3.67
 Q.3 (a) What is hardness of water? Write down the causes of hardness, principal bad effects and removal technique of hardness from water. 4.67
 (b) Describe the coagulation process. Also write down the factors influencing coagulation. 4.00
 (c) A water treatment plant consumes ferrous sulphate and lime as coagulant at the rate of 10 mg of ferrous sulphate per litre of water. Find out the quantities of FeSO₄ and lime required to treat 9 million litres of water 3.00
 Q.4 (a) Compare slow sand filters with rapid sand filters. How do pressure filters differ from rapid sand filters? 4.00
 (b) Explain the theory of disinfection. What are the requirements of a good disinfectant? 3.67
 (c) Compare the contact times necessary to obtain 99.99% kill of bacteria in water under the following conditions: 4.00
 (i) Free residual chlorine of 0.15 mg/l and $k = 1.1 \times 10^{-2}$ per second.
 (ii) Combined residual chlorine of 2 mg/l with $k = 1.2 \times 10^{-3}$ per second.

SECTION-B

- Q.5 (a) What do you mean by community participation? Discuss the methodologies to ensure community participation. 4.00
 (b) Explain the role of sanitation in controlling the transmission of excretoriated diseases. 3.00
 (c) Discuss the elements of water supply with neat sketch. 3.00
 (d) Write down the problems in ground water development. 1.67
 Q.6 (a) Define water hammer. Describe the different phases of water hammer. 3.67
 (b) What are the main types of distribution networks? What are their relative advantages and disadvantages? 4.00
 (c) Calculate the flow in the following pipe network for the inflow and outflow shown in the diagram using the Hardy cross method. 4.00



- Q.7 (a) What are the reasons for local development of Bangla and Moon handpumps? Draw a neat sketch of a Bangla hand pump tubewell. 4.00
 (b) Compare the costs, advantages and disadvantages of a No.6 handpump, Tara handpump and manually operated deep tubewell. 3.67
 (c) Draw a clear diagram of a very shallow shrouded tubewell. Discuss the usefulness of SST and VSST under conditions in the coastal areas of Bangladesh. 4.00
 Q.8 (a) Explain the method of jar test for approximately determining the dosage of coagulant in raw water. 3.00
 (b) How does women empowerment defer from the concept of gender issues? 2.00
 (c) Discuss the factors to be considered while selecting the site for a storage reservoir. 3.00
 (d) Calculate the peak water demand for a design period of 10 years of rural village having a present population of 5000. The average per capita water consumption is 80 lpd with peak factor of 3. The population growth rate is 1.5% and the loss and wastage is 30%. 3.67

CE 341
Environmental Engineering - I

Full marks: 70

Time: 3 Hours

- N.B.:- (i) Answer any **SIX** questions, taking **THREE** from each section.
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 (iii) Use separate answer script for each section.
 (iv) Assume reasonable value for any data missing.

SECTION - A

- 1.1(a) Describe the various types of pump on the basis of services. 4.00
 (b) Write down the different impurities present in water and also the effects of each. 4.67
 (c) A cast iron pipe supplies 425 mgd water from 30 miles away. Loss of head due to friction is estimated to be 300 ft. All other head losses are neglected. Determine the size of the pipe. Assume $f = 0.0075$. 3.00
- 2.1(a) Write down the causes of hardness. What are the principal bad effects of hardness of water? 3.00
 (b) Describe the sedimentation with coagulation process. Write down the reaction involved when $FeSO_4$ is used as coagulant. 4.67
 (c) One million gallon of water per day passes through a sedimentation tank which is 20 ft wide, 50 ft long and 10 ft deep. (a) Find the detention time. (b) What is the average velocity of flow? (c) If the suspended solids content of the water averages 40 ppm, what weight of dry solids will be deposited every 24 hours assuming 75% removal? (d) What is the overflow rate? → (AZIZ OR JE PAGE: 208) 4.00
- 3.1(a) Describe the break point chlorination with necessary sketch and also describe the different zones. 4.00
 (b) Discuss various desalination processes. 4.00
 (c) A rapid sand filter is to be designed for a capacity of 27000 m³/day. What should be the number and size of the units? Calculate the percentage of filtered water required to wash the filter bed and the capacity of wash water tank. Assume: rate of filtration = 5 m³/m²/hr, rate of washing = 35 m³/m²/hr, length of filter run = 24 hrs. including 5 min. for filter washing and 10 min. for resettlement of sand bed. 3.67
- Q.4(a) Describe the procedure for the design of the shrouding materials. 4.00
 (b) Write short notes on: (i) SST, (ii) VSST, and (iii) House hold filters. 4.67
 (c) Design a strainer for a 38 mm diameter tubewell to be operated by a No. 6 hand pump at the rate of 40 lpm. Slot No. 10 strainer having a 40% open area is to be used. The entrance velocity should be around 16 mm/sec. 3.00

SECTION - B

- Q.5(a) What are the functions of a Civil Engineer as an Environmental Engineer? → 2.67
 (b) Write down the importance of water supply engineering for the development of civilization. 3.00
 (c) How can you criticize the intermittent system of water supply? 2.00
 (d) Design a pumping unit capable of lifting 5 mgd of water from an intake well to the treatment plant against a static head of 60 ft; length of suction main is 12 ft and that of rising main is 400 ft. The pump will work in two shifts of eight hours each. Assume velocity of flow 6 fps; friction factor is 0.01 and efficiency is 75%. 4.00
- Q.6(a) Explain briefly the essential elements of a water supply system for a city with the help of neat sketches. 3.67
 (b) How does socio-economic aspect influence a community water supply system? 3.00
 (c) A water treatment plant consumes ferrous sulphate ($FeSO_4$) and lime as coagulant at the rate of 10 mg of $FeSO_4$ per litre of water. Find out the quantities of $FeSO_4$ and lime required to treat 9 million litres of water. 3.00
 (d) How can you protect the tubewell water from contamination? 2.00
- Q.7(a) Explain the method of Jar test for approximately determining the dosages of coagulant in raw water. 3.00
 (b) Draw the section elevation of a No. 6 hand pump and label the different components of the pumps. 2.67
 (c) State the methods of making population estimation. Which method do you consider best for population estimation in Bangladesh? 3.00
 (d) Describe graphical method to determine the storage capacity of the reservoir. 3.00
- Q.8(a) What are the factors that occur on water during filtration? Explain the theory of filtration to explain such effects. 5.00
 (b) What do you mean by Roughing Filtration? Why is it adopted? 2.67
 (c) Water to be disinfected by using bleaching powder having chlorine demand of 2.5 mg/l. If daily need of water is 5×10^6 litres and the available chlorine in bleaching powder is 30%, find the amount of bleaching powder required per day. 4.00

The End

Heaven's Light is Our Guide
DEPARTMENT OF CIVIL ENGINEERING
RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
 B.Sc. Engineering Third Year Fifth Semester Examination, 2013

CE 341
Environmental Engineering -I

Full marks: 70

Time: 3 Hours

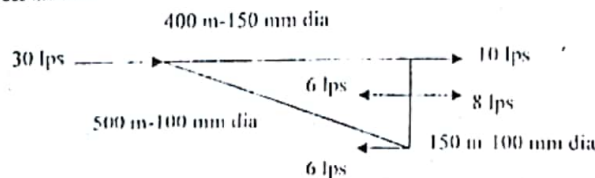
- N.B:-**
- (i) Answer any SIX questions, taking THREE from each section.
 - (ii) Figures in the margin indicate full marks.
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SECTION-A

- | | | |
|---------|---|------|
| Q.1(a) | Describe the concept of community participation. Explain the participatory planning with diagram. | 3.67 |
| (b) | Discuss the importance of considering gender issues for sustainable development of water supply system. | 3.00 |
| (c) | How does women empowerment defer from the concept of gender issues? | 2.00 |
| (d) | What do you mean by sanitation? Discuss the objectives of sanitation. | 3.00 |
| Q.2 (a) | Write down the advantages and disadvantages of rainwater harvesting in Bangladesh. | 3.00 |
| (b) | Briefly describe the (i) Rower pump (ii) Disco pump (iii) Tara hand Pump (iv) Moon hand pump and (v) Bangla Hand Pump. | 5.00 |
| (c) | Design a strainer for 30 mm diameter tube well to be operated by a No. 6 hand pump at the rate of 45 lpm, slot No. 10 strainer having a 50% open area is to be used. The entrance velocity should be around 0.01 m/sec. | 3.67 |
| Q.3 (a) | What do you mean by fire demand? Describe a fire hydrant with neat sketch. | 3.00 |
| (b) | What do you mean by water hammer? When does it occur? Describe the various phases of it. How can you overcome this phenomena. | 4.00 |
| (c) | Calculate the peak water demand for a design period of 10 years of rural village having a present population of 2500. The average per capita water consumption is 70 lpcd with peak factor of 3. The population growth rate is 1.5% and the loss & wastage is 30%. | 3.00 |
| (d) | Write the main differences between SST & VSST. | 1.67 |
| Q.4 (a) | What are the various impurities present in water? write down their Bangladesh standard and WHO guideline value. | 5.00 |
| (b) | A water sample with pH 9 had a caustic alkalinity of 90 mg/l, Bicarbonate alkalinity of 80 mg/l and total hardness are formed by Ca, Mg, K, Na, and Sr with 60, 50, 20, 105, 45 mg/l respectively. Find out total hardness, total alkalinity, carbonate hardness of non carbonate hardness. | 4.00 |
| (c) | In water treatment process a flocculator was designed to treat 450m ³ water which kinematic viscosity is 1x10 ⁻³ m ² /sec at 20° C. Determine the required power to operate the electric motor for good flocs formation. | 2.67 |

SECTION-B

- | | | |
|--------|--|------|
| Q.5(a) | Explain the working principle of a pond sand filter with a neat sketch. Also write the differences between PSF & RSF. | 3.67 |
| (b) | Define intake. Describe the factors that should be considered in the design of an intake. | 4.00 |
| (c) | Calculate the flow in the following pipe network for the inflow and outflow shown in the diagram using the Hardy cross method. | 4.00 |



- | | | |
|---------|--|------|
| Q.6(a) | Explain briefly the essential elements of a water supply system for a city with the help of neat sketches. | 4.00 |
| (b) | State the general consideration for pumping installation. | 3.00 |
| (c) | Design a pump a pumping unit capable of lifting 5 mgd of water from an intake well to the treatment plant against a static head of 60ft; length of suction main is 120 ft and that of rising main is 400ft. The pump will work in two shifts of eight hours each. Assume velocity of flow is 6 fps, friction factor is 0.01 and efficiency is 75%. | 4.67 |
| Q.7(a) | Draw a typical chlorination curve and explain the reaction zones. Explain break point chlorination. | 4.67 |
| (b) | Write down the methods of leak detection in water distribution system. | 3.00 |
| (c) | A slow sand filtration unit produces 1000 m ³ of water per day. How much bleaching powder with 30% available chlorine will be required per day to treat this water with a chlorine dose of 5 mg/l? | 4.00 |
| Q.8 (a) | Explain the process of arsenic removal by the method of co-precipitation and adsorption indicating the possible chemical reactions involved. | 3.00 |
| (b) | A 100 mm diameter tube well is sunk to withdraw water from a 10 m thick confined aquifer having co-efficient of permeability equal to 0.80 lps/m. The depth of water below the piezometric level is 30 m and it falls 2m in the tube well while pumping. Calculate the discharge of the tube well when the radius of circle of influence is 30 m. | 3.00 |
| (c) | Write short notes on "Community mobilization" Discuss the socio-economic aspects of WSS in rural and urban areas. | 3.00 |
| (d) | Explain the grid-iron method of layout of distribution pipes. | 2.67 |

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ROZLA
 CE 11

CE 11
 Environmental Engineering-I

Full Marks: 70

Time: 3 Hours

N.B.:-

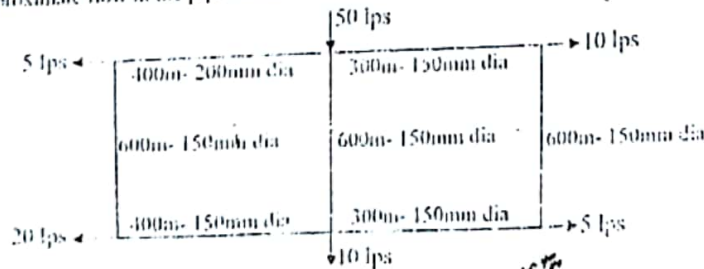
- (i) Answer 10 questions, taking THREE from each section
- (ii) Write in the margin indicate total marks.
- (iii) Use separate answer script for each section
- (iv) Assume reasonable value for any data not given.

SECTION-A

- Q.1(a) What are the engineering aspects of water supply? Discuss the objectives of water supply system. 3.67
- (b) Briefly discuss the elements of water supply system. 4.00
- (c) Discuss the factors affecting the consumption of water. 4.00
- Q.2(a) Briefly discuss various problems of ground water development in Bangladesh. 3.00
- (b) What are the factors that should be considered for selecting the site for storage reservoir? 4.67
- (c) Design a pumping unit capable of lifting 5 mgd of water from an intake well to the treatment plant against a static head of 100ft, length of suction main is 1200ft and that of rising main is 400ft. The pump will work in two shifts of eight hour each. Assume velocity of flow is 6fps, friction factor is 0.01 and efficiency is 75%. 4.00
- Q.3(a) Describe the lead end method of layout of distribution pipe with diagram. Also mention the advantages and disadvantages of this method. 4.00
- (b) What are temporary and permanent hardness? Discuss the removal technique of them. 3.67
- (c) The analysis of water from a house shows the following results in mg/l, Ca = 60, Mg = 18, Na = 103.5, K = 19.5, HCO₃ = 244, Cl = 78.1 and SO₄ = 220.3. Find the total hardness, Carbonate hardness and non-carbonate hardness. 3.00
- Q.4(a) What are the present practices of water supply in the rural areas of Bangladesh? 5.00
- (b) Briefly describe the (i) Rower pump, (ii) Disco pump, (iii) Lora hand pump, (iv) Moon hand pump and (v) Bangladesh pump. 3.67
- (c) A water treatment plant consumes ferrous sulphate (FeSO₄) and lime as coagulant at the rate of 10 mg of FeSO₄ per litre of water. Find out the quantities of ferrous sulphate and lime required to treat 9 million litres of water. 4.00

SECTION-B

- Q.5(a) Why is the No. 6 hand pump tube well the most popular in Bangladesh? Write down the advantages and disadvantages of No. 6 hand pump tube well over other shallow tube well. 3.67
- (b) Write short notes on the following terms: (i) Household filters, (ii) Solar desalination. 4.00
- (c) The average rainfall intensity and distribution in Bangladesh in 1999 shows that the total rainwater available in that year is 2200 mm excluding the losses, and a storage volume of 30% of the available rainfall is required for a year-round supply. What are the minimum storage and catchment area required for drinking and cooking at the rate of 16 lpcd for a family of 8 persons? 4.00
- Q.6(a) Draw a typical chlorination curve and explain the reaction zones. Explain breakpoint chlorination. 4.00
- (b) Explain the method of jar test for approximately determining the dosage of coagulant in raw water. 3.00
- (c) Find out the approximate flow in the pipes in the network shown below: 4.67



- Q.7(a) What do you mean by sanitation? Discuss the objectives of sanitation. 3.00
- (b) Water supply, sanitation and health education are interrelationship to each other. Justify the statement. 3.00
- (c) Explain the suitability of various types of sanitation system in Bangladesh. 2.67
- (d) How can you protect the tube well water from contamination? 3.00
- Q.8(a) Write short notes on 'Community mobilization'. Discuss the socio-economic aspects of WSS in rural and urban areas. 4.00
- (b) Describe how community participation can be sustainable water supply and sanitation program? 4.00
- (c) Discuss the importance of considering gender issues for sustainable development of water supply system. 3.67

The End

Full marks: 70

Time: 3 Hours

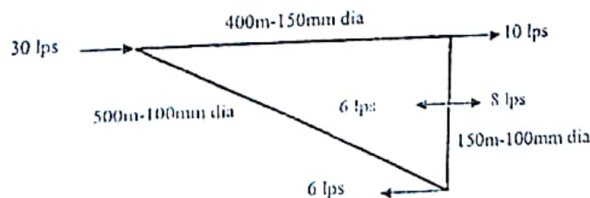
- N.B:-
- Answer any SIX questions, taking THREE from each section.
 - Figure in the margin indicate full marks.
 - Use separate answer script for each section.
 - Assume reasonable value for any data missing.

SECTION-A

- Q.1(a) What is Environmental Engineering? Discuss the objectives of sanitation. 3.00
 (b) Finermetes and explain briefly the essential elements of a water supply system for a city with the help of neat sketches. 5.00
 (c) Enumerate the factors to be considered in planning a municipal water supply system. 3.67
- Q.2(a) Discuss the factors affecting the consumption of water. 4.67
 (b) Describe various types of springs and explain their place as source of water supply schemes. 3.00
 The population of a city was 124000 in 1970 and 156500 in 1950. (i) What was the annual rate of increase? (ii) What will be the probable population in 2020? 4.00
- Q.3(a) What do you mean by No. 6 hand pump tubewell? Draw the sectional elevation of a No. 6 hand pump and label the different components of hand pump. 4.00
 (b) Describe the working principles of a pond sand filter with a neat sketch. What are problems encountered in the operation and maintenance of pond sand filters? 3.67
 (c) Design a strainer for a 38 mm diameter tubewell to be operated by a No. 6 hand pump at the rate of 40 lpm. Slot No. 10 strainer having a 50% open area is to be used. The entrance velocity should be around 0.01 m/sec. 4.00
- Q.4(a) Write down the advantages and disadvantages of rainwater harvesting in Bangladesh. 3.00
 (b) Draw a clear diagram of a VSST. Discuss the usefulness of SST and VSST under condition in the coastal areas of Bangladesh. 4.67
 (c) Calculate the minimum capacity of the storage tank required for a family of 8 persons to be supplied with 10 lped of rainwater. The yearly rainfall intensity is 2.5m and the rainfall distribution is such that at least 35% of the rainwater must be stored for uninterrupted water supply throughout the year. Also calculate the minimum catchment area required when the coefficient of runoff is 0.7. 4.00

SECTION - B

- Q.5(a) What are the impurities present in water and write down their effects. 4.00
 (b) Write down the principles of particle setting in water. Discuss the different types of setting of particles in water with diagrams. 3.67
- Q.6(a) Calculate the dimensions of a rectangular plain sedimentation tank to treat $12 \times 10^6 \text{ m}^3/\text{day}$. Assume a detention period of 6 hours and the velocity of flow as 20 cm per second. 4.00
 (b) What are the purposes of roughing filtration? Explain the mechanism of roughing filtration. 4.67
 (c) What are the factors influencing disinfection of water? Explain the process of disinfection by chlorination. 3.00
 A rapid sand filter is to be designed for a capacity of $27000 \text{ m}^3/\text{day}$. What should be the number and size of the units? Calculate the percentage of filtered water required to wash the filter bed and the capacity of the wash water tank. 3.67
- Q.7(a) What are the purposes for which pumping is adopted in water supply schemes? 4.00
 (b) Write down the method of leak detection in water distribution system. 4.00
 (c) Calculate the flow in the following pipe network for the inflow and outflow shown in the diagram using the Hardy cross method. 4.00



- Q.8(a) How does Socio-Economic aspect influence a community water supply system? 3.00
 (b) Describe the concept of community participation. Explain the participatory planning with diagram. 3.67
 (c) How does community mobilization govern the sustainable development of community water supply system? 3.00
 (d) How does women empowerment defer from the concept of gender issues? 2.00