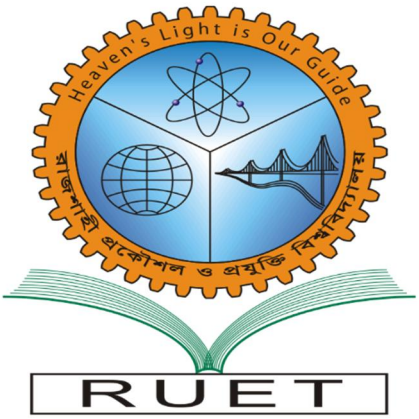
"Heaven's Light is Our Guide"

Rajshahi University of Engineering & Technology

Department of Civil Engineering

4th year 7th semester examination 2016



MEJBAUL ISLAM
CE-120003
SEC: A

Structural Analysis & Design-III
CE-411
Theory

1. State and prove Muller's-Breslau principle. **14,05**
2. Derive stiffness matrix for a beam element. **14,12,08,04**
3. Derive the relation D = FA, where the symbols have their usual meanings. **14,11,15**
4. Derive the relation A = SD, where the symbols have their usual meanings. **13,12,10,09,07,06,05,04**
5. What is composite structure? Give some examples. **11,08,05**
6. What are the limitations of moment distribution method? **04**

Problems

1. Moment distribution. **(1-set)**
2. Influence line. **(1-set)**
3. Slope deflection. **(1-2-set)**
4. Composite structure. **(1-set)**
5. Stiffness matrix method. **(2-set)**
6. Flexibility matrix method. **(1-2-set)**

Irrigation & Flood Engineering
CE-421
Irrigation

1. Define irrigation. Write scopes of irrigation. Describe engineering scope of irrigation. **14,12,08**
2. What are the requirements for the success of an irrigation project? How an irrigation project planned? **11,07**
3. Explain the necessity of irrigation in a tropical country like Bangladesh. Compare inundation irrigation with perennial irrigation. **13,11,09,07**
4. What are the purposes which is served by the application of irrigation water to the soil? **05**
5. What are the various types of irrigation? Discuss merits and demerits of each type. 09
6. Compare well irrigation & canal irrigation. **12**
7. What are the harmful effects and benefits of irrigation? **15**
8. Loam is the ideal soil for irrigation-why? Discuss the statement. **14**
9. What are the purpose of irrigation water? Write briefly. **14**
10. What are the different forms of soil moisture? Show with diagram and describe them briefly. **14**
11. Draw a neat sketch showing the extraction pattern of moisture from soil by plant roots. **10**

12. What are the different forms of soil water? Show with diagram and describe them in brief. **07,05,15**
13. Discuss the effect of soil texture and soil structure on the soil moisture content. **12**
14. Write short notes on: **13,11,05**
    i. Field capacity, Wilting coefficient, Moisture holding capacity of a soil. **13,11**
    ii. Soil texture and soil structure **11**
    iii. Pusta, irrigation efficiency. **10**
    iv. Paleo irrigation and kor water depth. **10,08**
    v. Permanent wilting point, Readily available soil moisture, crop ratio. **09,08,07**
    vi. Time factor, capacity factor, outlet factor, overlap allowances. **08**
    vii. Root zoned depth, cash crop, soil moisture deficiency. **07,06**
15. What do you mean by duty of water? How duty of water can be improved, describe briefly. **14,13**
16. "All the water are not fit for irrigation crops"-explain critically the above statement. **09,08,07,06**
17. What is meant by duty and delta of canal water? Derive a relationship between duty and delta for a given base period. **10,06**
18. What points do you consider while determining duty of irrigation water? **15**
19. What do you mean by optimum utilization of irrigation water & water distribution efficiency? **14,08**
20. What is permeability? Why is it necessary that a good irrigation soil be permeable? How is permeability determine? **11**
21. What are the objectives of command area development? How are these achieved through command area development program? **07**
22. What are the methods used for estimating consumptive use of water for a particular crop at a particular place? Explain in details the one which is most widely used in our country and the reasons for preferring that particular method. **13**
23. Write the factors that affecting the consumptive use of water. **06**
24. What is meant by crop-rotation? Write the advantages of crop rotation. **12**
25. Why gram is frequently used in crop rotation? **05**
26. Give the factors which should be considered while planning crop rotation. **05**
27. List the different crop rotations which are commonly practiced with wheat and rice. **05**
28. Define irrigation. What are the factors that affecting the choice of the method of irrigation. **10,06**
29. What are the essential requirements for a successful sub-surface irrigation? Compare drip irrigation and buried irrigation. **09,05**
30. Write down the factors which are very essential for the proper selection of the method of irrigation. **10**
31. Enumerate the conditions which are favorable for the adoption of sprinkler irrigation in Bangladesh. **13,09**
32. "The sprinkler system of irrigation is excellent method but not used in our country"-discuss in brief. **08**
33. What are the main component parts of sprinkler irrigation? Give a brief account them. **05**

34. Draw neat sketches to illustrate the following methods:
    i. Furrow irrigation.
    ii. Free flooding.
    iii. Check flooding.
    iv. Check method, corrugation irrigation. **09**
    v. Border irrigation, Basin irrigation. **05**

    State under what circumstances you will recommend their use.
35. What is furrow irrigation? Show with diagram and write its advantages & disadvantages. **14**
36. Enumerate the limitations of sprinkler irrigation. **10**
37. Point out the advantages of Border irrigation method. **06**
38. Name the methods of water distribution adopted for the following crops and describe them with sketch- **07,15**
    i. Potato, ii. Orchard, iii. Paddy.
39. What are water lifting devices for low lift and without using any power or machineries? Describe any one devices with diagram. **14**
40. What are the indegeneous methods of water lifting? Describe any of them with sketches. **15**
41. Describe trickle method of irrigation. What are the advantages & disadvantages of using this method in Bangladesh? **14**
42. Difference between furrow and sprinkler irrigation. **06**
43. What methods of irrigation will you select where irrigation water is saline, scarcity of water in there and is hill tracts? Discuss them in brief. **07,15**
44. Which methods of irrigation is suitable in the hilly region? Describe in brief. **08**
45. 'Lift irrigation is a costly irrigation system'- Explain. Discuss the salient features of lift irrigation. Compare lift irrigation and gravity irrigation. **11,09**
46. Difference between lift irrigation and flow irrigation. **07**
47. Describe direct irrigation and irrigation scheme. Give necessary sketches. **15**
48. Write the advantages and disadvantages of lift irrigation and gravity irrigation. **15**
49. What are water balance parameters? Describe briefly the water balance formulae for crop water requirement. **12**
50. What do you understand by potential evapotranspiration? How does it differ from actual evapotranspiration? **08**
51. What risk do you consider in case of wastewater irrigation? What are the advantages and disadvantages of using this method in Bangladesh? **08**
52. What is meant by water logging? What are the causes of water logging? What steps will you take to improve an already water logged tract? **14,10,09,07,06,15**
53. How irrigated land may become waterlogged? **10,07**
54. What do you know by leaching requirement? **07**
55. What are the principal causes of water-logging in a canal irrigation tract? **11**
56. What is meant by interference between tube wells? What is the ideal distance between two adjacent tube wells? **11**
57. How will you determine yield of tube well? **11**

58. Well irrigation is an anti-water logging measure explain. **11,07,06**
59. How will you broadly classify the anti-water logging measures? How percolation from rainfall can be reduced to prevent water logging conditions. **05**
60. What do you mean by $C_2 - S_2$ water? Discuss its usefulness for irrigating fine textured soil. **14,08,06**
61. What is meant by saline & alkaline soil? How you will proceed to reclaim saline land. **14,11,06**
62. Distinguish between saline and alkaline soil and how you will reclaim them? **15**
63. Write down the name of impurities which make water unfit for irrigation. **10,08,07**
64. What is SAR? Discuss the effects of salts on plant growth. **12,10,07**
65. Discuss the effect of SAR on the irrigation water. **08**
66. What are the process of land reclamation? Discuss the different land reclamation processes. **05**

Flood Engineering

Flood, Flood management & Flood assessment

1. What are the causes of flood? Describe them in light of flood in Bangladesh. **14,13,11,07**
2. What do you mean by flood control, flood mitigation, flood management & flood protection? **11,10,06,15**
3. Define flood. Describe natural and human related causes of flood in Bangladesh. **15**
4. Critically explain flood control economics. Describe the costs that are included in flood management. **15**
5. Write a short notes on:
    i. Flood forecasting and warning system. **14,13,12**
    ii. Flood control by the construction of levees. **13**
    iii. Flood plain zoning, flood proofing, emergency evacuation. **12,10,15**
    iv. Repelling groyne. **10**
    v. Return period, concentration time, critical intensity. **05**
    vi. Storage reservoir, watershed management, floodways. **15**
    vii. Maximum probable flood, design flood **15**
6. Explain the direct and indirect benefits of flood management. **14**
7. What is meant by design flood? What is its importance? **11,08,07,06**
8. Discuss briefly the tangible and intangible benefits of flood. **12**
9. Describe briefly the structural measures for flood management. **14**
10. Explain what do you understand by the return period? Give few formula which are used to determine the return period. **13,09**
11. Discuss the validity of Probability method of flood estimation. List the demerits if any. **08**
12. What are floodways? What are the advantages and disadvantages? **07**
13. Discuss the various methods for the flood plain management. **07**
14. Enumerate the various methods which can be used for estimating design flood discharge from a certain catchment and discuss one of these methods in details. **10,08,06**
15. Describe rational method for estimation of design flood. **15**
16. What are the limitations of method of estimating design flood? **08**

17. What is concentration time? How is it estimated? **08**
18. Write down the procedure to estimate the design flood for any return period using Gumbel's distribution. **14,09**
19. How do you justify the Gumbel's extreme value distribution to describe the annual peak flood discharge? **13**
20. Enumerate the name of different institutions responsible for flood management of Bangladesh and briefly discuss their responsibilities. **12,11**
21. Is land management effective to flood control? Discuss in brief. **08**
22. What are the various methods employed for the management of floods and for reducing the damage caused by them. **13**
23. Briefly discuss about the flood management and mitigation strategies of Bangladesh. **11**
24. Explain the direct and indirect tangible losses due to floods. **13**
25. Random variable. How is it obtained from frequency analysis? **09**

Sediment Transport

26. Describe the importance of sediment transport in designing earthen irrigation canals. **14**
27. Discuss the mechanism involve in sediment transportation. **15**
28. Write short notes on the following: **06**
    i. Sediment hazards of irrigation water.
    ii. Salt concentration in irrigation water and their utility in irrigation.

Channel design

29. State and explain Kennedy's theory. Describe the design procedure of regime channel by adopting Kennedy's theory. **14,08**
30. What is the basis of design of regime channel? **15**
31. Describe Kennedy's theory for the design of irrigation channel in alluvial soil. **08**
32. "Channel improvement by deepening is preferred to widening"- explain by comparing two channel after improvement. **14,15**
33. "Lacy's theory is an improvement over Kennedy's theory"- explain. **07,06**
34. Enumerate the two recognized silt theories. Explain how one theory is an improvement over the other. (Kennedy and Lacy) **12,11**
35. Show that the silt carrying capacity of a canal is proportional to $V_0^{2.5}$ in accordance with Kennedy's theory. Where, V_0 is the critical velocity of flow. **10**
36. Write short notes on: **14,13**
    i. Berms, Borrow pits, Counter Berms & Balancing depth. **(give suitable diagrams)**
    ii. Alluvial canal and non-alluvial canal, Initial regime & Final regime. **13**
    iii. Berm width, Spoil Bank, Pusta, counter berm. **07,06**
37. Describe different indirect protection methods used to protect the embankment of a river. **13**
38. What is economical section? What is the condition of economical section? **08**
39. What are the causes of bank recession? What are the different types of bank protection? Explain briefly the indirect bank protection techniques. **12,09**

40. What is meant by regime? Differentiate between regime in natural rivers and in artificial channels. **09**
41. Differentiate between 'Initial regime & Final regime'. **12**
42. Compare briefly the silt theories of Kennedy and Lacy. Write the purposes that are served by fully formed berms. **15**
43. Define berm. What are the various purposes served by berm? How much berm width is provided in an earthen canal under the following conditions- **09**
    i. Canal bed level is above natural surface level.
    ii. Canal is in balancing depth.
    iii. Canal is in deep cutting.
44. Distinguish between: **15**
    i. Suspended load & bed load.
    ii. Initial regime and final regime.
    iii. Berm and counter berm.
    iv. Borrow pit and spoil bank.

Assessment of Irrigation water

45. Write the name of the methods for the assessment of irrigation water supply. Compare area method with the volumetric method assessment of irrigation water supply. **14,12**
46. What are the different methods of assessment of irrigation water? Which method do you think best and why? **13**
47. Define consumptive use of water. What are the factors which influence consumptive use of water for any crop and how consumptive use is related in the total requirement of water for the crop? **09**
48. How does consumptive use of water differ from evapotranspiration and duty of water?
49. Why irrigation water assessment is necessary? How you will assess the irrigation water if you are the irrigation engineer in an irrigation project? **07**
50. Write six numbers of factors affecting consumptive use of irrigation water.
51. According to Dorenbos and pruilt what are the limitations of Blancy Criddle formula for estimating consumptive use of water. **12**
52. Why is it necessary to collect the charges for irrigation water supplied to the cultivator? Explain. **11**
53. Write short notes on: **12**
    i. Water storage efficiency.
    ii. Net irrigation requirement.
    iii. Leaching requirement.
54. Discuss volumetric sale of water versus sale on basis of area. **09**
55. Discuss the assessment of irrigation water charges on area basis. Write down the drawbacks of this method. **10**
56. How quality of irrigation water is analyzed? Give the classification of irrigation water and explain them. **15**

Geotechnical Engineering-III
CE-431
Mat Foundation, Drilled Shaft, Caissons & Cofferdam
SAM
Mat Foundation

1. What is mat foundation? At what situation do you suggest mat foundation instead of individual column footing? Discuss. **14,12**
2. Explain the steps performed by any engineer in selecting the best foundation for a given structure to be considered at a given site. **08**
3. What is compensated foundation? **13,07**
4. Describe in brief different types of mat foundation. **13**
5. How does the sub-soil exploration report help a Civil engineer? **11**
6. What are the design consideration of mat foundation? **10**
7. What are the design procedure of a mat foundation? **08**
8. What are the various methods of soil stabilization? Discuss. **09**

Drilled Shaft

9. How can you determine load bearing capacity of drilled shaft based on settlement? Explain. **14**
10. How can you determine the load bearing capacity of drilled shafts in clay? Explain. **13,07**
11. How would you determine the load bearing capacity of a drilled shaft in sand & clay? **09,06**
12. Describe the construction procedure of drilled shaft. What are the merits and demerits of drilled shafts? **07**

Cofferdams

13. What are cellular cofferdams? Why circular cell is generally preferable to the other cellular types of cofferdams? **14**
14. Describe the design procedure of cellular cofferdams. **14**
15. Discuss the advantages of diaphragm type cellular cofferdam over circular cofferdam. **12**
16. Write down the requirements of filling materials to be used in circular cofferdam. **12,10,08,07**
17. What are the possible types of failure to be analyzed for a circular cofferdam? **11,09,08,06**

Caisson

1. Mention the application of caissons. **13**
2. How you would estimate the load carrying capacity of an open caisson? **14**
3. Write short notes on:
   - **i.** Vibroflotation, Stone columns, Wick drains, Pneumatic caisson. **12,11**
4. Describe with neat sketches the construction procedure of a box caisson. **09**
5. What are the causes of tilting a caisson during sinking? What corrective measures can be taken to resist tilting? **08,06**
6. Describe the construction procedure of a pneumatic caisson. What are the advantages and drawbacks? **08,07**

7. Differentiate between box caisson and open caisson. **07**
8. What are the different types of failure to be analyzed for concrete seal thickness of caisson? Explain. **06**

Sheet Pile, Braced Cut, Pile Foundation & Machine foundation

MMS

Sheet Pile

9. What are different types of sheet piling walls? Draw the sketches showing the pressure distribution**. 14,10,09**
10. Write down the uses of sheet pile. **08**
11. What is Rowe's moment reduction theory? How can you apply it to sheet pile design? **08,06**
12. Describe the Rowe's moment reduction for anchor sheet pile walls penetrating sand. **13**
13. Differentiate between anchor sheet pile wall and cantilever sheet pile wall. **12**
14. What is tie back? How do you determine the ultimate resistance of a tie back? **12**
15. Derive the relationship to computing the depth of embedment of a cantilever sheet pile wall in clayey soil. **12,10,09,07**
16. Describe the design procedure if cantilever piling penetrating in sandy soils. **06**
17. Derive the relationships for the depth of embedment of anchor sheet pile penetrating into granular soil by free earth support method.
18. Describe the design procedure of anchored sheet pile wall in sandy soil using fixed earth support. **07**
19. Write down the design procedure of anchored sheet pile wall using equivalent beam method. **11,09,06**
20. What are the differences between anchored and cantilever sheet piles? Write down their uses. 08

Braced Cut

21. Write down the function of the followings: **14, 06**
    i. Wales.
    ii. Strut.
    iii. Lagging.
    iv. Soldier beam.
    v. Tie back.
22. How can you analyze the factor of safety of braced excavation against bottom heave? Explain. **12,10**
23. Write down the components of braced cut. **11,09**
24. Describe the design procedure of different component of braced excavation. **10**

25. Explain how can you determine lateral earth pressure on braced excavation?
    (i) Stratified soil, (ii) sand, (iii) soft clay, (iv) stiff clay. **07**
26. Draw the different types of pressure diagrams used for braced cut design. **06**

Pile Foundation

27. Describe the significance of pile load test. **14**
28. How can you determine the ultimate capacity of group piles in saturated clay? Discuss. **13**
29. What are the conditions where a pile foundation is more suitable than a shallow foundation? **08,07**
30. What is batter pile? Under what condition do you use pile cap? **08,07,06**
31. Write down the functions of pile cap. **06**
32. Write down under what situation do you suggest batter piles? **07**
33. What is pile cap? What are the assumptions made in the design of a pile cap? **12**
34. Under what situation do you use pile cap? **10**
35. Write short notes on:
    i. Laterally loaded pile. **13,11**
    ii. Negative skin friction. **13,11**
36. Classify piles based on their functions. **11**
37. Differentiate between cast-in place & precast piles. **11**
38. What is laterally loaded pile? How would you determine the ultimate load of a laterally loaded pile using Meyerhof's method? **10**
39. What do you mean by negative skin friction? What are the causes of negative skin friction? Write down the remedial measures of negative skin friction. **09,07**

Machine foundation

40. Discuss the design criteria for reinforcement and construction details of a machine foundation. **12**
41. Discuss the criteria for design of machine foundation. **08**
42. Differentiate between:
    i. Damped & un-damped vibration. **13**
    ii. Viscous & non-viscous damping. **13**
43. Define the followings:
    i. Damped vibration. **12**
    ii. Resonance. **12**
    iii. Mass spring system. **12**
44. What is machine foundation? What parameters do you consider for the analysis of a machine foundation? Explain. **07,06**

CE-451
Transportation Engineering-II
Railway

1. Define railway track & state the requirements of an ideal railway track. **14,13,12,11,10**
2. Define capacity of railway track & suggest measures to increase it. **11,06,05**
3. Explain the causes of failure of railway embankment. **09,06,05**
4. Draw a typical single line railway track in cutting showing full details. **07**

5. Name the different components of a railway track and discuss the functions of each components.**10**
6. Define gauge of a railway track. Discuss the factors which affect the choice of rail gauge. **14,13,12,11,05**
7. What are the disadvantages of adopting different gauges on the railways?**09,07**
8. Define track alignment. Discuss the factors which control the alignment of railway track.**14,13,11,08,05**
9. Discuss the various causes of wear of rails and suggest suitable remedial measures.**10**
10. Draw a typical single line track on embankment showing full details. **12**
11. Differentiate between:
    i. Hogged & check rail.**10**
    ii. Corrugated & corroded rail.**10**
    iii. Loading gauge & construction gauge.**08,07**
    iv. Broad gauge & meter gauge. **08**
12. Write Short notes on:
    i. Coning of wheel, Hogging of rail, Roaring of Rail, Construction gauge, Capacity of a railway track, Corrugation of rail, check rail, Marshalling yard. **14,13,11,10,09,07,06,05**
    ii. Buffer stops, Compensator, Negative Super elevation & Fouling mark. **14,13,11,08**
    iii. Sleeper density, cant deficiency, Ruling gradient. **13**
    iv. Interlocking, Compensator, Water column.**13,12,11,07**
    v. Creep of rails, Fastening of rails & Sleeper density.**12**
    vi. Sleeper density, concrete sleeper, Welded rail.**10,08**
    vii. Rail gauge, Spike, Fish plates, Depth of Ballast cushion. **04**
    viii. Switch, crossing number, interlaced sleepers, level crossing.**10,06**
13. What do you mean by coning of wheels? How does it effects the rails?**09**
14. Describe the factors which influence the selection of site for a railway station. **14,13,08,06,05**
15. Why is the maintenance of a railway track necessary? List the various items of maintenance. What are the causes of accidents? **14,13,08,07**
16. Deduce an expression for the determination of degree of the curve in the field.**10**
17. What are the desirable properties of good ballast?**11,10**
18. What material as ballast you would recommend for high speed track and why?**10**
19. What is a sleeper? What should be the requirements of ideal material of the sleeper? **13,08,06,05**
20. Explain the necessity of ballast in railway track or function of ballast.**08,06,05**
21. Describe the merits and demerits of wooden sleepers.**09**
22. Discuss the merits & demerits of different types of sleepers.**07**
23. Explain the functions of sleepers in railway track.**11**
24. What is rail joint? Describe the characteristics of a good rail joint.**10**
25. What are the requirements of an ideal fastening?**07**
26. Draw a neat sketch of a right hand turnout and show various parts on it. 12

27. What do you mean by signaling? Write down the objectives and classifications of signaling which are based on the railway track. **12,09,06,05**
28. Draw a typical layout of signal at the divergent junctions and convergent junction.07
29. Draw a neat sketch of a semaphore signal. **08,06**
30. What are the causes of railway accidents? Suggest some preventive measures to minimize the accident.**09**

Highway

1. How subgrade is prepared? Briefly discuss the methods of soil stabilization. **14,13,12,11**
2. Discuss the steps for the preparation of subgrade and write the name of various equipment used. **08**
3. Discuss the scopes and methods of soil stabilization.**10,08,07,06**
4. What are the basic principles in soil stabilization? **05**
5. Classify the pavement on the basis of structural behavior also bring out the points of difference.**05**
6. Define low-cost road. Write the names of low-cost roads. Why are low cost roads preferred in developing countries? **13,11,10,09**
7. Explain in brief the construction procedure of BBM road. **14**
8. What improvement do you suggest to reduce the dust nuisance of WBM road? 06
9. Explain the steps that must be considered during rolling of WBM road.**07**
10. Define CBR. What are the desirable properties of sub-grade soil?**10**
11. What are the applications of CBR test? **06**
12. With neat sketch. Explain the significance of vertical & wheel load for structural design of road.**11**
13. Discuss the principle and application of soil-bitumen. What are the factors affecting the properties of soil-bitumen.**08,04**
14. What are the factors influencing the properties of soil-cement? Explain how soil-cement mix is designed. **05**
15. Draw a neat sketch of flexible pavement cross section and show its different component. Discuss their functions also.**10**
16. Describe the effects of climatic variations on the design of pavements and their performance.**10**
17. Explain with neat sketch, the effects of contact pressure and wheel load in flexible pavement.**07**
18. Write purpose and methods of application of seal coat, prime coat & tack coat.**04**
19. Explain the importance & functions of sub-grade course & wearing course of a flexible pavement. **13,09,07**
20. Write the precautions adopted during rolling. Discuss the bad effects of defective rolling. **13,11,10,09**
21. Briefly discuss the traffic factors that are considered for the design of flexible pavement. **13,12**
22. Discuss the significance of the design wheel load factors to be considered in flexible pavement design.**09**
23. Write the precautions adopted for rolling WBM road. **12,05**

24. What are the general causes of pavement failure.**08**
25. What are the various types of failure in flexible pavement? Explain the causes. **08**
26. What are the causes of surface failure of in case of bituminous road? Describe the procedure of pothole repair. **13,11**
27. What are the causes of base failure in case of flexible pavement? Explain them.**09**
28. What are the causes of development of pot holes and corrugation in bituminous road and how they are repaired? **12,08,07,06,05**
29. What are the causes of waves and corrugation formation in flexible pavement? Suggest remedial measures. **14**
30. What are the role of mineral aggregate & bitumen in bituminous mix? **07,06**
31. How OBC value is ascertains from the graph?**06**
32. Differentiate between:
    i. ESWL and EWLF. **14,08**
    ii. Flexible pavement and rigid pavement. **14,08**
    iii. Contact pressure and inflation pressure.**14,08**
33. Explain the term "present serviceability index".**14,08**
34. Explain 'Flexible and Rigid' pavements and bring out the points of difference.**06**
35. Write short notes on:
    i. Prime coat, Frost action, Dowel bar, Soil stabilization, Mud pumping.**14,13,12,11,10,09,06,05**
    ii. CBR, OBC,G_{mm}, Marshall stability & VMA. **13,12,11,05**
    iii. WBM road, Stabilized road & Bituminous road.**12**
    iv. Pot holes, Flow, Tack coat, Soaked CBR. **09,08**
    v. ESWL, seal coat, Warping stress, Radius of relative stiffness.**07,05,04**
36. What are the requirements of good joint filler and sealer materials? Explain with neat sketches. **14,13,12,11,10,09,08,06,05**
37. Why joints are intentionally provided in rigid pavement?**07,06**
38. What are the desirable properties of joint filler and sealer? **08,07,05**
39. Discuss the object of the following types of joint with neat sketches: **09**
    i. Expansion joints.
    ii. Contraction joints.
    iii. Longitudinal joints.
40. For rigid pavement, explain the statement "joint is nothing but is design crack.**11,05**
41. Draw a neat sketch of expansion joint provided in rigid pavement.**11**
42. Briefly discuss the various joints provided in rigid pavement. **13,12,10**
43. Define CBR. Why and how soaked CBR value is determined in the laboratory? **14**
44. Write short note on CA and Bitumen in bituminous mix.**14**
45. What is the role of bitumen, aggregates & filler in bituminous mix?**04**
46. Briefly discuss the necessary steps of bituminous mix design.**14,05**
47. What are the desirable properties of bituminous mixes?**05**

Waterway

1. Explain the importance of waterway in our country. Why is shore protection necessary? **14,11,10.**
2. Explain with neat sketches shore protection structures.**08**
3. Discuss the advantages and disadvantages of waterway mode of transportation.**09,08,05**
4. What are the requirements of a good port? **06**
5. Explain the importance of dock yard.**05**
6. Write short notes on: (with neat sketches)
   - **I.** Break water, Docks, Jetty, Littoral drift, Coastal structures. **14,12,11,09**
   - II. Jetties, Docks, Bulk heads, Revetment & Sea walls. **13,11,09,06**
7. Define waterway transportation. What are the advantages & disadvantages of waterway transportation? **12**
8. Define harbor. What are the requirements of a good harbor? What are the factors which effect the site selection of a harbor? **13,12,09**
9. What are the factors to be considered before sketching a site for harbor?**11**
10. Difference between:
    - i. Port and harbor. **11,10,08,07,06,05**
    - ii. Jetty and break water. **08,07,06,05**
    - iii. Dry dock and wet dock. **08,07,06,05**

Problems

- Bituminous mix design.
- CBR method.
- Thickness calculation/design of rigid and flexible pavement.
- Requirements of track components of 1km BG/MG track.
- Switch.
- Super elevation.
- Crossing number, heel divergence related math.

Environmental Engineering-II
CE-441
Wastewater collection, Primary treatment, Secondary treatment

1. Describe the procedure of estimation of waste water design flow according to Melbourne and Metropolitan Board of Works. **14**
2. Briefly describe the separate system and combined system of sewerage. Write down the conditions favorable for separate system. **14**
3. Write down the conditions which are favorable for a separate system and favorable for a combined system. **12**

4. What are the basic elements of conventional sewerage system? Compare the merits and demerits of separate sewerage system. **08**
5. Compare the merits and demerits of separate and partially combined/combined sewerage system for waste water collection. Which method do you suggest for Rajshahi City? Explain. **07,06,05**
6. As you an environmental engineer, do you think combined sewerage system is suitable for Rajshahi City Corporation? Give reasons on your opinion. **08,07**
7. Differentiate between conventional sewerage system and small bore sewerage system. Justify the scope of introducing small bore sewerage system in Bangladesh. **11,08**
8. What are the technical advantages of small bore sewerage systems over a conventional sewerage system? **10,08,05**
9. What do you mean by Dry Weather flow (DWF)? What are the factors that affect DWF? **05**
10. What factors bring in significant cost savings in small bore sewerage system? **10**
11. Briefly describe the factors are to be carefully considered for selection of sewers materials. **14**
12. Why the sewers are to be laid at continuous gradient in downward direction? **09**
13. Briefly describe the factors that must be considered in the selection of sewerage system. Which system do you suggest for RUET & why? **10**
14. Briefly discuss the factors that influence the estimation of wastewater flows for the design of sanitary sewer system. Outline the procedure of estimating design wastewater flow. **12**
15. Write short notes on: (i) Sullage & (ii) Peak factor. (iii) Screens. (iv) Grit chamber (v) Skimming tank. (vi) lamp holes. (vii) clean outs. (viii) Comminutor. **10,07,06,05**
16. Differentiate between influent and effluent. **07,06**
17. What do you mean by 30-20 standard sewage effluent? **05**
18. Briefly discuss sewers of different materials. **13**
19. What do you mean by sewer? Describe the different sewer sections with necessary sketches. **11,06**
20. Why circular section is considered better than other sections? **06**
21. What are the factors which are considered while determining the quantity of dry weather flow? **11**
22. Describe the laying and testing procedures of sewers and state the points to be carefully attended during this process. **14,13**
23. Why sewage needs treatment? What are different phases of sewage treatment? **06**
24. What are the various treatment processes of waste water? Write down the basic features of composting latrine. **08**
25. Describe with special references the purpose, nature of grit, number & location of grit chamber in primary treatment of wastewater. Discuss briefly the design aspects of it. **13,11**
26. What do you mean by detritus tanks? What are the uses of detritus tanks? 06
27. What is industrial waste? Mention the important characteristics of industrial waste. **11,10,09,**08,07,04

28. How the problems of treatment of industrial wastes are tackled? **07,04**
29. Describe the biological treatment process of industrial waste. **09**
30. What are the objectives of plain sedimentation? Discuss the various aspects of primary clarifiers. **13,12,08**
31. Briefly discuss the sedimentation process. **12,08**
32. What are the factors that affecting sedimentation process? **10**
33. What do you mean by sludge? What is the necessity of sludge disposal? How is the sludge disposal off by method of disposal on land? **13,09,08,07**
34. Enumerate the various methods of sludge disposal. **07**
35. Draw a net sketch of lagoon and explain lagooning as a method of sludge disposal. **08**
36. Introduce the micro-organisms important for wastewater treatment. **13**
37. What are the purpose of installing sedimentation tank in the sewage treatment plant? **11,10**
38. What is coagulation? Critically examine the process of coagulation of sewage. **10,09**
39. What is coagulant and coagulation? **09,04**
40. Write down the advantages and disadvantages of coagulation process in sewage treatment plant. **11,06**
41. Draw a flow diagram of complete sewage treatment plant and describe the activities of its various units. **04**
42. Write down the role/importance of micro-organisms in wastewater treatment. Classify them based on their energy and carbon source. **12,10**
43. Discuss the various phases of bacterial growth with growth curve/in terms of cell number. **13**
44. Write down the technical advantages and economic considerations SBS system. **14,13**
45. What is SBS system? Why self-cleansing velocity is not required in SBS system? **12,08**
46. What is self-cleaning velocity and non-scouring velocity? What are the basic of providing self-cleaning velocity and non-scouring velocity in the design of sewers? **09,07,06**
47. What is the importance of self-cleaning velocity? **07,06**
48. Briefly discuss the aerobic, anoxic and anaerobic decomposition of organic matter. **12**
49. How does trickling filer works? **10,07,06,05**
50. Explain the principles of biological waste treatment process. Out line the differences between aerobic oxidation and anaerobic digestion processes of waste treatment. **05,04**
51. What is meant by secondary treatment of sewage? Mention the design aspects of trickling filters. **11**
52. Discuss about the trickling filter with its advantages and disadvantages. **14,10,07**
53. Describe the working principle of two-stage trickling filter with flow diagram. **13,10,09**
54. Draw the flow diagram of single stage and two stage trickling filter treatment plant. **07,06,05**
55. Briefly discuss the objectives of biological treatment of wastewater. Describe the processes of decomposition. **14**
56. What is the difference between unit operation and unit process? **04**
57. What is activated sludge process? **10**

58. Explain the basic operations involved in the activated sludge process with the help of a flow diagram. **14,10,09,07,04**
59. Write down the advantages and disadvantages of activated sludge process. **13**
60. Explain the factors that affect the sludge digestion process in brief. **13**
61. Write short note on aquaculture in wastewater treatment. **13**
62. What do you mean by aquaculture? Describe the significance of aquaculture from engineering point of view. **09,07,06,05,04**
63. Describe the skimming tanks with special reference to their purpose, design aspects and disposal of floating substances. **12,09**
64. What do you mean by sludge bulking? What are the influencing factors for the development of sludge bulking? **08,07,06,05**
65. Write down the reasons of sludge bulking. What are S.V.I and S.D.I? **12,08**
66. Compare the activated sludge process and trickling filter system. **12**
67. State the properties of activated sludge. **11**
68. Write down the advantages and disadvantages of oxidation pond. **08**
69. Discuss the various types of waste stabilization ponds. **12,11,04**
70. Write short notes on: (i) Imhoff tank (ii) SVI.
71. Define a grease and oil trap. Explain its principle of working and mention the reasons for excluding grease and oil from sewage. **08**
72. What is biogas? **05,04**
73. Discuss in brief the factors that affect fermentation process in the biogas fermentation. **07,05,04**
74. What do you mean by Biogas digester? Name the different types of Biogas digester with sketches. **06**
75. Explain the symbolic relationship between bacteria and algae in a facultative stabilization pond. **06**
76. State and proof Marai's theorem? **04**

Introduction & Sanitation

77. What are the principal objectives of sanitation? Briefly describe the various problems of sanitation faced in Bangladesh. **14,10,08,07,05,04**
78. Describe the sanitation practice at rural areas in Bangladesh. How can it be improved? **07,04**
79. "The topic of environment has gained extraordinary importance in the recent past"-why? **08**
80. What is sanitation? How sanitation can improve the quality of living in a community? **09**
81. What are the objectives of sanitation? Describe the route of transmission of excreta-related diseases. **11**
82. Explain the role of sanitation in controlling the transmission of excreta-related diseases. **11,10**
83. How do socio-economic aspects influence the water supply, sanitation and health education facilities? **13**

84. Explain the role of water, sanitation & hygiene education in improvement of public health. **12**
85. Give five examples of water related diseases and discuss their causes of occurrence and routes of transmission. **12**
86. What is environmental sanitation? How sanitation can improve the quality of living in a community? **12,07,05**
87. List some common infectious diseases that are transmitted due to lack of proper sanitation. **05**
88. What is environmental sanitation? Briefly describe the sanitation systems with respect to human waste management. **11,10**
89. What is meant by hygienic education? Hygiene education is an important component of water supply and sanitation system. Explain it. **09,07,04**
90. What are the differences between conventional and more successful hygienic education program. **07**
91. Relate sanitation system with the availability of water supply system. **04**
92. Give three examples of faecal-disease transmission. **04**

On-site human waste management

93. Briefly discuss the technical aspects of compost latrines. What factors may restrict its successful application in Bangladesh? **14,13,10,05**
94. Briefly discuss the various types of compost latrines. **04**
95. Describe with example the on-site and off-site sanitation system. **08,07,04**
96. Distinguish between communal sanitation and public toilet facilities. What is the primary reason for failure of such communal and public sanitation facilities? How can these services be made sustainable? **14,12,11,07,05**
97. What are the advantages and disadvantages of communal sanitation system? **10,07**
98. How can you solve the problems of single-pit VIP latrines by the alternating twin-pit VIP latrines? **10,09**
99. Describe the VIP latrine with its design consideration. **14,13,10**
100. Briefly discuss the suitability of a conventional pit latrine. How can the main disadvantages of a simple pit latrine be improved in a VIP latrine system? **12**
101. What are the basic elements of a VIP latrine technology? How can the main disadvantages of simple pit latrine be improved in a VIP latrine system? **11,08,05**
102. What variations does the ROEC have from the VIP technology? Briefly describe the merits and demerits of ROEC. **11,07,06,05**
103. Classify the various types of pour-flash sanitation systems and discuss their relative advantages and disadvantages and their applicability. **12,10**
104. What are the basic improvement made in the pour flash sanitation technology compared to simple pit and VIP technology? What are the general consideration for pour flash latrines? **07**

Septic tank

105. Prepare a schematic diagram showing various components of a septic tank. Position the inlet and outlet devices carefully and explain how these can influence the septic tank operation. **14**
106. Discuss the various important processes that take place in a septic tank with neat sketches. Briefly describe the design procedure of a septic tank. **12,11,07,06,05**
107. What are the objectives of providing manholes in sewer line? Where is it located? **12,09,08**
108. What is manhole?**09**

Environmental Management

109. What do you mean by environmental management? **14,13,09**
110. What is global warming? **14,13,08**
111. How you can achieve the proper management of environment? **09**
112. What do you mean by environmental pollution? Briefly discuss the various steps in order to keep the environment friendly? **08**
113. Discuss in brief the preventive measures should be taken to have an effective control for pollution of water. **14,11**
114. Define air pollution. Explain the effects of air pollution in brief. **13**
115. "The air pollution has become one of the vital and challenging environmental problems of the modern society"- explain it. **09**
116. What do you mean by air pollution? Discuss the various sources of air pollution. **11**
117. Show the characteristic differences between air pollution and noise pollution. **09**
118. Describe briefly the effect of air pollution on the environment. **11**
119. What is environmental management? What are the main components of environmental management? **12**
120. What is pollutant? Classify the pollutants from ecosystem point of view. **10**
121. Explain in detail the concept of Green House Effect. **09**

Quality of Sewage

122. Define BOD & COD. What are the limitations of BOD test? **14,13,12,10,09,08,07,06,05**
123. Why BOD is always less than COD? **08**
124. How can you work out BOD of a sewage sample? **13**
125. Why BOD test is carried out? / Importance of BOD test? **12,10**,09
126. Why COD of sewage is higher than its BOD in general? Write the limitation of BOD test. **13,12,09**
127. What do you understand by first stage BOD? Deduce an expression for it. **14,06,05**